United States
Department of
Agriculture

Forest Service

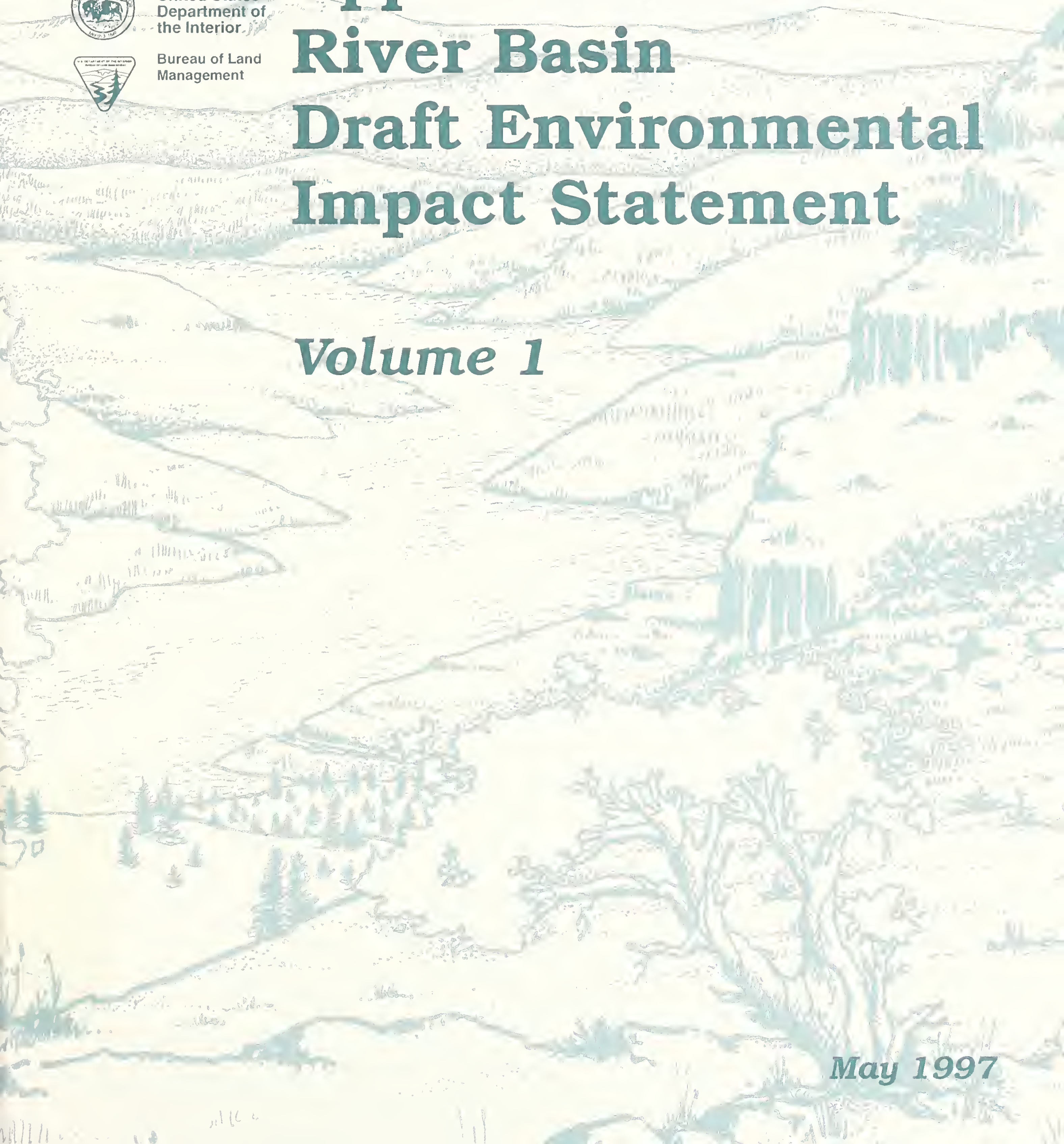
United States
Department of
the Interior

Bureau of Land
Management

Interior Columbia Basin Ecosystem Management Project

Upper Columbia River Basin Draft Environmental Impact Statement

Volume 1



May 1997

Organization of This Document

APPENDIX

Appendices provide additional documentation and details.

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Chapter 5 provides a list of preparers of the EIS, literature cited, a glossary, and a distribution list.

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Chapter 4 discloses and evaluates the possible environmental, social, and economic consequences of implementing the proposed alternatives.

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Chapter 3 presents and compares the alternatives, including the no-action alternative, incorporating the latest scientific information.

PURPOSE AND NEED

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Chapter 2 describes the existing environment, including conditions and trends that will be addressed by the alternatives.

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Chapter 1 introduces the purpose & need for the proposed action, the decisions to be made, the public issues surrounding the proposal, and other information.

PREFERRED ALTERNATIVE

UCRB
Draft EIS

The Preferred Alternative as selected by the Executive Steering Committee and the reasons for selection.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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Upper Columbia River Basin

Draft Environmental Impact Statement

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Abstract

The Forest Service (Department of Agriculture) and Bureau of Land Management (Department of Interior) propose to develop and implement a scientifically sound, ecosystem-based management strategy for lands they administer in parts of Idaho, Montana, Wyoming, Nevada, and Utah. A new strategy is proposed to meet dual needs of restoring and maintaining ecosystem health while sustaining a flow of goods and services from these lands to support people's needs. Two *no action* alternatives, which would not meet these needs, were analyzed. Alternative 1 (the No Action alternative) continues current management under existing approved plans. Alternative 2 (modified No Action alternative) proposes no change to current management plans except to replace interim strategies known as PACFISH and INFISH, with long-term direction. Five management alternatives (*action alternatives*) were developed and analyzed to meet the dual needs of the proposed action. Alternative 3 minimizes changes to local plans addressing only priority conditions that most hinder effectiveness or legal conditions while providing a more consistent and coordinated management approach. Alternative 4 aggressively restores ecosystem health through active management using an integrated ecosystem management approach. Alternative 5 emphasizes production of goods and services at a regional level consistent with ecosystem management principles. Alternative 6 emphasizes an adaptive management approach based on monitoring, evaluation, and scientific findings. Alternative 7 emphasizes reducing short-term risks to ecological integrity and species viability by establishing a system of reserves on federal lands. In general, Alternatives 4 and 6 would be most effective in transitioning toward healthy ecosystems in the long term; Alternatives 3, 5, and 7 moderately effective; and Alternatives 1 and 2 would be least effective. In the short term Alternative 1 would provide highest levels of commodity values; Alternatives 2, 3, and 4 moderate levels; and Alternative 6 and 7 low (in the long term, Alternatives 4 and 6 would increase; 1, 2, and 5 would decrease; 3 and 7 would remain stable). Alternatives 4 and 6 would provide high levels of amenity values in the long term, moderate levels for Alternative 7, and Alternatives 1 and 2 would actually result in a long-term decline of amenity values. The selected alternative will best achieve a combination of the following: restoring long-term ecosystem health and ecological integrity, supporting people's economic and/or social needs, providing consistent direction to federal managers within a broad ecological context, and emphasizing adaptive management over the long term. Mitigation of adverse effects has been incorporated into the Preferred Alternative. Monitoring, determined to be an important part of adaptive management, is outlined in the Implementation Framework appendix.

Comments on the Draft EIS should be received no later than 120 days after the notice of availability of the EIS is published in the *Federal Register*. Comments should be sent to:

ICBEMP EIS Team
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UCRB Draft EIS
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UCRB Summary

Introduction

The Interior Columbia Basin Ecosystem Management Project (ICBEMP), was initiated for the following reasons: (1) To identify existing or emerging resource problems that transcend jurisdictional boundaries, such as forest health problems and declining salmon populations, and to propose potential solutions that can best be addressed on a large scale; (2) To develop management strategies using a comprehensive, "big picture" approach, and disclose interrelated actions and cumulative effects using scientific methods in an open public process; (3) To address certain large-scale issues, such as species viability and biodiversity, from a larger context using an interagency team. This method is more cost-effective than each Bureau of Land Management (BLM) District and National Forest conducting independent efforts; (4) To respond to President Clinton's July 1993 direction to develop a scientifically sound, ecosystem-based management strategy for lands administered by the BLM or Forest Service in the upper Columbia River Basin; and (5) To replace interim management strategies (PACFISH and Inland Native Fish Strategy) with a consistent long-term management strategy.

In response to these developments, management direction for Forest Service- and BLM-administered lands across parts of seven states in the Pacific Northwest was re-examined and two draft environmental impact statements (EISs) were prepared for different portions of the area covered by the Interior Columbia River Basin Ecosystem Management Project, which is referred to as the *project area*.

The planning area for the ***Upper Columbia River Basin EIS*** includes lands administered by the BLM or Forest Service in parts of Idaho, western Montana and Wyoming, and northern Nevada and Utah that are drained by the Columbia River system. The Upper Columbia River Basin (UCRB) EIS covers approximately 45 million acres of agency-administered lands.

The planning area for the **Eastside EIS** includes lands administered by the BLM or Forest Service in the interior Columbia River Basin, upper Klamath Basin, and northern Great Basin that lie east of the crest of the Cascade Range in Oregon and Washington. The Eastside EIS covers approximately 30 million acres of agency administered lands.

Proposed Action

The Forest Service and BLM propose to develop and implement a coordinated, scientifically sound, ecosystem-based management strategy for lands they administer in the upper Columbia River Basin.

Purpose of and Need For Action

The **purpose** of the Proposed Action is to take a coordinated approach and to select a management strategy that best achieves a combination of the following: (1) Restore and maintain long-term ecosystem health and ecological integrity; (2) Support economic and/or social needs of people, cultures, and communities, and provide sustainable and predictable levels of products and services from lands administered by the Forest Service or BLM; (3) Update, or amend if necessary, current Forest Service and BLM management plans with long-term direction, primarily at regional and subregional levels; (4) Provide consistent direction to assist Federal managers in making decisions at a landscape level within the context of broader ecological considerations; (5) Emphasize adaptive management over the long term; (6) Help restore and maintain habitats of plant and animal species, especially those of threatened, endangered, and candidate species. This would be done primarily by moving toward desired ranges of landscape conditions at a subregional and regional ecosystem basis; (7) Provide opportunities for cultural, recreational, and aesthetic experiences; (8) Provide long-term management direction to replace interim strategies (PACFISH and Inland Native Fish Strategy); and, (9) Identify where current policy, regulation, or organizational structure may act as challenges to implementing the strategy or achieving desired future conditions.

The alternative management strategies examined in detail in this EIS are based upon underlying **needs** for:

- ◆ Restoration and maintenance of long-term ecosystem health and ecological integrity.

- Supporting the economic and/or social needs of people, cultures, and communities, and providing sustainable and predictable levels of products and services from Forest Service- and BLM-administered lands.

Issues

Project scoping identified the issues and concerns people have about public lands managed by the BLM or Forest Service. They include:

Issue 1: In what condition should ecosystems be maintained?

Issue 2: To what degree, and under what circumstances should restoration be active (with human intervention) or passive (letting nature take its course)?

Issue 3: What emphasis will be assigned when trade-offs are necessary among resources, species, land areas, and uses?

Issue 4: To what degree will ecosystem-based management support economic and/or social needs of people, cultures, and communities?

Issue 5: How will ecosystem-based management incorporate the interactions of disturbance processes across landscapes?

Issue 6: What types of opportunities will be available for cultural, recreational, and aesthetic experiences?

Issue 7: How will ecosystem-based management contribute to meeting treaty and trust responsibilities to American Indian tribes?

Decisions to be Made

Once the Final EIS has been completed, the responsible officials can decide to:

- Select one of the alternatives analyzed within the Final EIS, including one of the No Action Alternatives (Alternative 1 or 2); or
- Modify an alternative (for example, combine parts of different alternatives), as long as the environmental consequences of the modified action have been analyzed within the Final EIS.

The alternative selected for implementation will be documented in the Record(s) of Decision.

Specific decisions involved in the selection of an alternative include adoption of:

- Management goals;
- A desired range of future conditions expected over the next 50 to 100 years;
- Objectives to be used in measuring progress toward attainment of the management goals; and
- Standards, which are required actions to be used in designing and implementing future management actions.

The Record(s) of Decision will do the following:

- Describe certain management activity levels expected and priorities for management;
- Provide a large-scale ecological context for Forest Service and BLM land-use plans;
- Help clarify the relationship of agency activities to ecosystem capabilities;
- Help develop realistic expectations for the production of economic and social benefits;
- Focus on regional and subregional issues;
- Describe a consistent aquatic conservation strategy;
- Establish general direction for management of habitat for threatened or endangered species or for communities of species that require management across broad landscapes to assure viability.

The Record(s) of Decision for the UCRB EIS are expected to amend current BLM and Forest Service land-use plans, Forest Service regional guides, and BLM State Director guidance, where they conflict.

Affected Environment

This summary focuses on portions of the environment that are directly related to

conditions addressed in the alternatives and that portray, at a regional scale, the significant conditions and trends of most concern to the public, the Forest Service, and the BLM with regard to lands administered by these two agencies within the project area.

Throughout this section, reference is made to "historical conditions" or the "historical range of variability". "Historical" in this EIS is intended to represent conditions and processes that are likely to have occurred prior to settlement of the project area by people of European descent. This time period is used only as a reference point to understand ecological processes and functions. In many cases it is neither desired, nor possible, to return to actual historical conditions.

Ecological Reporting Units, Hydrologic Unit Codes, and Clusters

The project area was divided into 13 geographic areas called Ecological Reporting Units (ERUs), which that were identified by a process that integrated human uses and terrestrial and aquatic ecosystem data. They are the basis for reporting information on (1) the description of biophysical environments, (2) the characterization of ecological processes, (3) the discussion of past management activities and effects from these, and (4) the identification of landscape management opportunities.

For the purposes of analyzing and summarizing much of the physiographic, aquatic, and vegetative information, a hierarchy of watersheds and watershed boundaries was identified by the Science Integration Team. For larger watersheds (regions, subregions, basins, and subbasins), watershed boundaries and their numeric Hydrologic Unit Codes (1st-field, 2nd-field, 3rd-field, and 4th-field, respectively) were adopted without change from those identified by the USGS. Smaller watersheds, referred to as watersheds (5th-field) and subwatersheds (6th-field), were identified as part of the Interior Columbia Basin Ecosystem Management Project process. Subwatersheds are the basic characterization unit for the *Integrated Assessment*, and were the basic mapping unit for identifying ERUs.

As a final step in the analysis the Science Integration Team integrated and regrouped initial information to evaluate the relative integrity of ecosystems in the project area. Forest, range, hydrologic, and aquatic systems were considered in deriving measures of integrity that attempted to answer three questions:

(1) Where are the areas of relatively high or low ecological integrity across the project area?

(2) Where are the opportunities to improve integrity? and

(3) What risks to integrity exist from management actions?

New groupings or "clusters" of subbasins were mapped, identifying forestland and rangeland ecosystems with similar existing vegetation, ecological functions and processes, and opportunities and risks. The clusters are further explained in the Integrated Summary of Forestland, Rangeland, and Aquatic Integrity section, later in this Executive Summary.

Summary of Conditions and Trends

The following sections summarize the existing conditions, and trends from historical conditions, for various elements of the ecosystem.

Physical Environment

Soils and Soil Productivity

- ◆ Soil productivity across the project area is generally stable to declining. Generally, greater declines in soil quality and productivity are associated with greater intensities of vegetation management, increased road construction, and livestock grazing.
- ◆ Soil organic matter and coarse wood (woody material larger than three inches) have been lost or have decreased as a result of displacement and removal of soils, and removal of whole trees and branches.
- ◆ There has been a loss of soil material from direct displacement of soils, as well as from surface and mass erosion. Erosion

can result from changed water runoff patterns from increased bare soils exposure, compaction, and concentration of water from roads.

- Changes in the physical properties of soils have occurred in conjunction with activities that increase bulk density through compaction, resulting in impaired soil processes and function, such as decreased porosity and infiltration, and increased surface erosion.
- Sustainability of soil ecosystem function and process is at risk in areas where redistribution of nutrients in terrestrial ecosystems has resulted from changes in vegetation composition and pattern, removal of the larger size component of wood, and risk of uncharacteristic fire.
- Floodplain and riparian area soils have reduced ability to store and regulate chemicals and water, in areas where riparian vegetation has been reduced or removed or where soil loss associated with roading in riparian areas has occurred. In these areas, water quantity may be reduced during low flows, and water quality may have less buffer from pollution.

Air Quality

- The current condition of air quality in the planning area is considered good, relative to other areas of the country.
- Wildfires significantly affect the air resource. Current wildfires produce higher levels of smoke emissions than historically, because fuel available to be consumed by wildfire has increased.
- Within the project area, the current trend in prescribed fire use is expected to result in an increase of smoke emissions.

Terrestrial Ecosystems

Terrestrial ecosystems descriptions are separated into forestlands, rangelands, and riparian areas. Changes in vegetation and habitat, with explanations of how these changes affect management decisions today, are discussed to set the stage for the management alternatives. Forestlands and rangelands in the planning area are highly diverse, ranging from moist areas near the Canadian border to dry areas in the Snake River Plain.

Due to the wide variety of plant species and landscape forms distributed throughout the planning area, there is a diversity of animal species found within forestlands, rangelands, and riparian areas. An assortment of animal species lives in these areas. There are 13,000 terrestrial animal and plant species addressed in the *Terrestrial Ecology* chapter of the *Assessment of Ecosystem Components*, of which 547 are vertebrates. Wildlife species in the planning area that are listed by the Federal government under the Endangered Species Act (1976) include: bald eagle and grizzly bear, which are listed as threatened; peregrine falcon, woodland caribou, gray wolf, and five molluscs listed as endangered; and spotted frog, mountain plover, and northern Idaho ground squirrel which are candidates for listing. The Forest Service and/or BLM classify 135 terrestrial vertebrates as sensitive species. Approximately 12,790 plant species are known in the project area; of these three are threatened, two are endangered, one is proposed for listing, and 526 are Forest Service or BLM sensitive species.

The existing vegetative cover within an area can vary based on past disturbances. The term potential vegetation type is used to represent all of the species that could grow on a specific site in the absence of disturbance, which is an integral part of that ecosystem and its evolution. For the UCRB EIS, potential vegetation types were grouped into seven potential vegetation groups: dry forest, moist forest, cold forest, dry shrub, cool shrub, dry grass, and riparian shrubland herb. Vegetation and habitats in terrestrial ecosystems are discussed by potential vegetation group.

Forestlands

Forest Service- or BLM-administered forestlands make up approximately 61 percent of the UCRB planning area (this includes alpine vegetation). Forestlands in the project area are divided into three groups — dry, moist, and cold forest potential vegetation groups — and are described by distribution, composition, structure, historical and current conditions, disturbance patterns, and disturbance processes.

- Interior ponderosa pine has decreased across its range with a significant decrease in old single-story structure. The primary transitions were to interior Douglas-fir and grand fir/white fir.

- There has been a loss of the large tree component (live and dead) within roaded and harvested areas. This decrease affects terrestrial wildlife species closely associated with these old forest structures.
- Western larch has decreased across its range. The primary transitions were to interior Douglas-fir, lodgepole pine, or grand fir/white fir.
- Western white pine has decreased by 95 percent across its range. The primary transitions were to grand fir/white fir, western larch, and shrub/herb/tree regeneration.
- The whitebark pine/alpine larch cover type has decreased by 95 percent across its range, primarily through a transition into the whitebark pine cover type. Overall, however, the whitebark pine cover type has also decreased, with compensating increases in Engelmann spruce/subalpine fir.
- Generally, mid-seral forest structures have increased in dry and moist forest potential vegetation groups, with a loss of large, scattered, and residual shade-intolerant tree components, and an increase in the density of smaller shade-tolerant diameter trees.
- There has been an increase in fragmentation and a loss of connectivity within and between blocks of late-seral, old forests, especially in lower elevation forests and riparian areas. This has isolated some animal habitats and populations and reduced the ability of populations to move across the landscape, resulting in a long-term loss of genetic interchange.
- There has been an increase in access for humans which has decreased the availability of areas with low human activities that are important to large forest carnivores and omnivores.

Rangelands

BLM- and Forest Service-administered rangelands make up approximately 38 percent of the UCRB planning area (including upland woodland vegetation). Rangelands include dry grass, dry shrub, and cool shrub potential vegetation groups. Only a few tree species, including juniper and lodgepole and ponderosa pine, are native to rangelands. These species typically are located in wetter areas, especially in riparian areas and areas close to forests.

- Noxious weeds are spreading rapidly, and in some cases exponentially, on rangelands in every rangeland cluster.
- Woody species encroachment and/or increasing density of woody species (sagebrush, juniper, ponderosa pine, lodgepole pine, and Douglas-fir), especially on dry grasslands and cool shrublands, has reduced herbaceous understory and biodiversity.
- Cheatgrass has taken over many dry shrublands, increasing soil erosion and fire frequency and reducing biodiversity and wildlife habitat. Cheatgrass and other exotic plant infestations have simplified species composition, reduced biodiversity, changed species interactions and forage availability, and reduced the systems' ability to buffer against changes.
- Degradation of riparian areas and subsequent loss of riparian vegetation cover, has reduced riparian ecosystem function, water quality, and habitat for many aquatic and terrestrial species.
- Expansion of agricultural and urban areas on non-Federal lands has reduced the extent of some rangeland potential vegetation groups, most notably dry grasslands, dry shrublands, and riparian areas. Changes in some of the remaining habitat patches due to fragmentation, exotic species, disruption of natural fire cycles, overuse by livestock and wildlife, and loss of native species diversity have contributed to a number of wildlife species declines, some to the point of needing special attention (such as sage grouse, Columbian sharp-tailed grouse, California bighorn sheep, pygmy rabbit, kit fox, and Washington and Idaho ground squirrels).
- Increased fragmentation and loss of connectivity within and between blocks of habitat, especially in the shrub steppe and riparian areas, have isolated some habitats and populations and reduced the ability of populations to move across the landscape, resulting in long-term loss of genetic interchange.
- Slow-to-recover rangelands (in general, rangelands that receive less than 12 inches of precipitation per year) are not

recovering naturally at a pace that is acceptable to meet management objectives, and are either highly susceptible to degradation or already dominated by cheatgrass and noxious weeds.

- Open road densities and human activity have increased. Higher densities cause many species to leave the area to avoid human activity. Recreation, plant gathering, and other uses of all types of habitat have steadily increased recently because of increasing human populations in the project area. These uses can increase wildlife displacement and vulnerability to mortality, can fragment habitat, and allow for access of exotic plants into new locations.

Aquatic Ecosystems

The condition of aquatic ecosystems in the project area is characterized by the hydrologic environments of watersheds, water bodies, riparian areas, and wetlands, then describing the status of fish species that use and are affected by these environments. Special attention is given to native fish species, especially wide-ranging salmon and trout species.

Watershed Processes

- Management activities throughout watersheds in the project area have affected the quantity and quality of water, processes of sedimentation and erosion, and the production and distribution of organic material, thus affecting hydrologic conditions. On federally managed lands, the most pronounced changes to watersheds are due to water diversions and impoundment, road construction, and vegetation alteration (including silvicultural practices, fire suppression, and forage production) and improper livestock grazing.
- Flow regimes of streams, rivers, and lakes throughout the UCRB planning area have been extensively altered by dams, diversions, and control of lake outlets. Banks and beds of streams, rivers, and lakes have been altered by bank and shore structures, transportation improvements, instream mining activities, flood-control works, and alteration of riparian areas. In general, the changes have been greatest for the larger streams, rivers, and lakes.
- Water quantity and flow rates have been locally affected by dams, diversions, and groundwater withdrawal. More subtle, but widespread changes in water quantity and flow patterns on federally managed lands have probably been caused by road construction and changes in vegetation due to silvicultural practices and livestock grazing.
- Within the UCRB planning area, some Forest Service- or BLM-administered streams are Water Quality Limited as defined by the Clean Water Act. On Forest Service-administered lands in the project area, the primary water quality problems are sedimentation, turbidity, flow alteration, and high temperatures. On BLM-administered lands, high sediment, turbidity levels, and temperatures are the primary reasons for listing as Water Quality Limited.
- Streams and rivers are highly variable across the project area, reflecting diverse physical settings and disturbance histories. Nevertheless, important aspects of fish habitat, such as pool frequency and large woody debris abundance, have decreased throughout much of the project area. Pool frequency and wood frequency are generally less in areas with higher road densities and in areas where timber harvest has been a management emphasis.
- The overall extent and continuity of riparian areas and wetlands has decreased, primarily due to conversion to agriculture but also due to urbanization, transportation improvements, and stream channel modifications.
- Riparian ecosystem function, determined by the amount and type of vegetation cover, has decreased in most subbasins within the project area.
- A majority of riparian areas on Forest Service and BLM-administered lands are either "not meeting objectives," "non-functioning," or "functioning at risk." However, the rate has slowed and a few areas show increases in riparian cover and large trees.

- Within riparian woodlands, the abundance of mid-seral vegetation has increased whereas the abundance of late-and early-seral structural stages has decreased, primarily due to fire exclusion and the harvest of large trees.
- Within riparian shrublands, there has been extensive spread of western juniper and introduction of exotic grasses and forbs, primarily due to processes and activities associated with improper livestock grazing.
- The frequency and extent of seasonal floodplain and wetland inundation has been altered by changes in flow regime due to dams, diversions, and groundwater withdrawal, and by changes in channel morphology due to sedimentation and erosion, channelization, and installment of transportation improvements such as roads and railroads.
- There is an overall decrease in large trees and late-seral vegetation in riparian areas.

Aquatic Species

Aquatic species in the UCRB planning area that are federally listed under the Endangered Species Act as threatened are the Lahnotan cuttroat trout, and Snake River chinook salmon (both the spring/summer and fall runs). Endangered species include the Snake River sockeye salmon and Kootenai River white sturgeon. Bull trout is a candidate species.

- The composition, distribution, and status of fishes within the planning area are substantially different than they were historically. Some native fishes have been eliminated from large portions of their historical ranges.
- Many native nongame fish are vulnerable because of their restricted distribution or fragile or unique habitats.
- Although several of the key salmonids are still broadly distributed (notably the cutthroat trouts and redband trout), declines in abundance, loss of life history patterns, local extinctions, and fragmentation and isolation in smaller blocks of high quality habitat are apparent.
- Wild chinook salmon and steelhead are near extinction in a major part of their remaining distribution.
- Habitat, hydropower development, harvest and hatchery management, and irrigation withdrawals all affect the survival of remaining anadromous fish populations within the interior Columbia River Basin to different extents. Land management activities have the affected habitat for wild chinook and steelhead and have limited their spawning and rearing success. The contribution of freshwater habitat to declines in anadromous fish populations would be least in central Idaho (for example wilderness areas and other protected areas), which is affected most by dams between spawning and rearing areas and the ocean, and the northern Cascades, but greater in the lower Snake and mid-Columbia drainages. The influence of hydropower on anadromous fish populations increases upriver where there are more dams between freshwater spawning and rearing areas and the ocean. Harvest of fish, which has been curtailed in recent years, has less effect today than it did historically. Hatcheries are an important element throughout the basin, but their effect on native stocks is variable.
- Core areas for rebuilding and maintaining biological diversity associated with native fishes still exist within the planning area.

Human Uses and Values

Human uses are characterized by the social and economic components of ecosystems in the upper Columbia River Basin. Emphasis is on the relationship of social and economic systems to Forest Service- and BLM-administered lands in the planning area. The economic and social setting provided here establishes the context for making land use choices compatible with human needs and expectations for these lands.

- The planning area is sparsely populated and rural, especially in areas with a large amount of agency lands. Some rural areas are experiencing rapid population growth, especially those areas offering high quality recreation and scenery. Population growth can stimulate economic

growth, provide new economic opportunities, and promote economic diversity in rural areas.

- Development for new residents is encroaching on previously undeveloped areas adjacent to lands administered by the Forest Service or BLM. New development can put stress on the political and physical infrastructure of rural communities, diminish habitat for wildlife, and increase agency costs to manage fire to protect new development.
- A wide variety of uses of Federal lands in the UCRB contribute to the regional economy and to local economies. At the regional level recreation is an important use of Federal lands in terms of economic value and amount of use. Most recreation use is tied to roads and accessible water bodies, although primitive and semi-primitive recreation is important. At the local level there are communities that rely on economic contributions from forest products, livestock grazing, mining, and recreation. Forest products and livestock grazing, while no longer solely dictating the economic prosperity of the region, remain economically and culturally important in rural areas distant from population centers and not sharing in regional growth.
- The public has invested in building road systems on agency lands in the UCRB planning area, primarily to serve commodity uses. On National Forest System lands, commercial timber harvest has financed 90 percent of the construction cost and 70 percent of the maintenance cost. Recreation now accounts for 60 percent of the use. Trends in timber harvesting and new road management objectives make the cost of managing these road systems an issue of concern.
- Costs of fire suppression on Federal lands in the UCRB have increased markedly in recent years and are expected to continue to increase, unless actions are taken to address fuel loading and vegetation structure, composition, and density.
- For those counties that have benefitted from Federal sharing of gross receipts from commodities sales on agency lands, changing levels of commodity outputs can affect county budgets.
- Agency social and economic policy has emphasized the goal of supporting rural communities, specifically promoting stability in those communities deemed dependent on agency timber harvest and processing. Even-flow of timber, bidding methods, export restrictions, and small business set-asides of timber sales have been the major policy tools on Forest Service-administered commercial forest lands. Regulation of grazing practices has been most important policy tool on BLM-administered rangelands.
- The factors that appear important in making communities resilient to economic and social change include population size and growth rate, economic diversity, social and cultural attributes, amenity setting, and quality of life. The ability of agencies to improve community resiliency depends on how land-use choices influence these factors.
- Predictability in timber sale volume from agency lands has been increasingly difficult to achieve. Advancing knowledge of ecosystem processes, changing societal goals, and changing forest conditions has undermined conventional assumptions underlying the quantity and regularity of timber supply from agency lands.
- Residents in the interior Columbia River Basin indicate strong support for a variety of land-use activities, but public opinion is divided on some issues where a choice and trade-offs are required. Trust or confidence in the Forest Service and BLM as land managers is strong at the national level, less so at the regional level. There is increased public interest in having a greater role in natural resource decision-making.

American Indians

American Indian populations are characterized by their cultural history, legal context, and existing Federal agency relations with the project area's 22 federally recognized American Indian tribes (16 with interest in the UCRB planning area). The ways in which American Indians use Forest Service- and BLM-administered lands is discussed in the context of their cultural, social, economic, religious, and governmental interests. The United States government has a unique responsibility to Indian tribes.

A culture includes religious, economic, political, communication, and kinship systems, as it is the whole set of learned behavior patterns common to a group of people, their interactive behavior systems, and their material goods.

Most of the prehistoric cultures of the project area belonged to either the Plateau or Northern Great Basin Culture Areas. Over thirty Plateau bands historically occupied the northern portion of the interior Columbia Basin. Many bands, including the three Northern Great Basin bands ~ the Bannock, Northern Paiute, and Shoshoni ~ occupied most of the project area's southern half. Differences existed among cultures, especially between tribal culture areas.

- ◆There is low confidence and trust that American Indian rights and intereste are considered when decisions are proposed and made for actions to be taken on BLM- or Forest Service-administered lands.
- ◆American Indian values on Federal lands may be affected by proposed actions on forestlands and rangelands because of changes in vegetation structure, composition, and density; existing roads; and watershed conditions.
- ◆Indian tribes do not feel that they are involved in the decision-making process commensurate with their legal status. They do not feel that government-to-government consultation is taking place.
- ◆Culturally significant species such as anadromous fish and the habitat necessary to support healthy, sustainable, and harvestable populations constitute a major, but no the only concern. American Indian people have concern for all factors that keep the ecosystem healthy.

Integrated Summary of Forestland, Rangeland, and Aquatic Integrity

Individual 4th-field Hydrologic Unit Codes (HUCs), also known as subbasins, were rated for integrity from separate aquatic, terrestrial, and hydrological viewpoints. These viewpoints, or integrity layers, were then analyzed together, or integrated, to provide a more unified view. This effort revealed groups or clusters of subbasins that exhibit a similar set of conditions or characteristics, reflecting a common management history; terrestrial and aquatic conditions, and management needs, opportunities, risks, and conflicts.

The integrated cluster summaries provided a project-wide context for the EIS team to tailor alternatives and evaluate their effects on a more site-specific scale (a few million acres) within the 144-million-acre project area. The cluster analysis also provides a context for evaluating cumulative effects.

The Clusters

Six forest clusters and six range clusters were delineated in the project area.

Forest Clusters: Subbasins with at least 20 percent of their area composed of dry forest, moist forest, or cold forest potential vegetation groups were classified as forest clusters. Relationships among variables reflecting vegetative conditions, hydrologic sensitivity, and human-caused disturbance of native forests were studied to identify dominant patterns and differences. What emerged were six forest "clusters" of subbasins with similar conditions.

Range Clusters: Selected subbasins with at least 20 percent of their area composed of dry grass, dry or cool shrub, woodland, and dry forest potential vegetation groups were classified as range clusters. Relationships among variables reflecting vegetative conditions, hydrologic sensitivity, and human-caused disturbance were also used in a similar, but not identical, way as forest clusters. Range cluster analysis identified dominant patterns and differences between subsets of these variables. What emerged were six range clusters, where subbasins within clusters were more like each other than subbasins in other clusters.

Measuring Integrity

Current **ecological integrity** was based on the analysis of the 164 sub-basins within the project area. Relative integrity ratings (high, moderate, low) were assigned by sub-basin for forestlands, rangelands, forest and rangeland hydrology, and aquatic systems. At present, 26 percent of the land in the project area that is administered by the BLM or Forest Service is in high, 28 percent in moderate, and 46 percent in low ecological integrity areas.

Description of Alternatives

Each alternative is characterized by themes, goals, objectives, and standards. Achieving such management objectives may require alteration of the physical and biological environment. The alternatives also include guidelines (see Appendix H), which are suggested actions that are designed to minimize the adverse effects associated with modifying the landscape.

Management Emphasis

For each alternative, one of six management emphases was given to each forest and range cluster, depending on the theme of the alternative. The management emphases are Conserve, Restore, Produce, Conserve-Restore, Conserve-Produce, and Restore-Produce. The three primary emphases are briefly defined as follows.

Conserve is a management emphasis on protection and maintenance of forest, rangeland, and aquatic conditions, health, and integrity. Management recognizes that natural processes dominate the landscape and gradual change will occur. **Restore** is a management emphasis designed to move ecosystems to desired conditions and processes, and/or to healthy forestlands, rangelands, and aquatic systems. A variety of management-induced activities dominate the landscape. **Produce** is a management emphasis directed at providing, growing, or making goods and services available for human needs and/or desires, while sustaining productivity and maintaining associated values. Under Produce strategies, consumption-based activities dominate the landscape. This management strategy is applied to areas available and suitable for resource production in order to provide goods and services.

Alternatives

Alternative 1 (No Action) continues management specified under existing Forest Service and BLM land-use plans. Implementation of this alternative would occur assuming recent budgets. Analysis of a No Action alternative is a requirement of the National Environmental Policy Act (NEPA) and BLM and Forest Service planning procedures. This alternative displays the likely outcome of Federal agencies use of existing plans to manage lands and resources into the future.

The No Action Alternative includes direction from 31 National Forest plans and 44 BLM plans in the project area (16 National Forest plans and 31 BLM plans in the UCRB planning area), which were prepared between 1975 and 1990. Although substantial variation exists among agency plans, the general management approach is to emphasize or accommodate sustained timber, wood fiber, and livestock forage production in an environmentally prudent manner while managing and protecting other resources and values. Timber and livestock management are integrated and coordinated with the maintenance or enhancement of wildlife and fish habitat, scenic quality, recreation opportunities, and other resource values to achieve overall multiple use goals and objectives. On many areas, management of other resources or values such as recreation, wilderness, big game and fish habitat, or cultural resources is emphasized.

Many current land-use plans were based on the assumption of healthy ecosystem conditions. With a general focus on production from

Table S-1. Management Emphases for Alternative 1 (Project Area)

	% of All Forest Clusters	Forest Cluster No.	% of All Range Clusters	Range Cluster No.
Management Emphasis				
Conserve	10	1	8	2
Produce	57	3, 4, 5	67	1, 4, 5, 6
Produce/Conserve	33	2, 6	25	3

forestlands, many current plans rely on even-aged management practices leading to forests characterized by a regulated forest of early- to mid-seral structures, and controlled densities and patterns. A minimum level of late/old structures and habitats was planned. On rangelands, vegetation management is focused on providing forage for livestock and wildlife while protecting forage productivity and coordinating with other resource uses.

Alternatives 1 and 2 are based on existing land and resource management plans currently being implemented by the BLM or the Forest Service. Each plan has desired future conditions or other expectations, and since the plans range from seven to twenty years old, there is a high degree of variation in the desired future conditions among the plans.

Lands managed by the BLM or Forest Service will continue to provide a mix of natural resource-based goods and services. Management focuses on providing resource outputs including timber, livestock forage, wildlife, and minerals while also providing for other multiple uses and values including aesthetics, recreation opportunities, viewable wildlife, and clean air and water. Current management has improved some conditions on public lands. Resource management emphasis continues to vary among National Forests and BLM districts based on the character of the land and resources, and public interests. Timber harvest and livestock outputs are planned to be near levels produced when the plans were approved. Timber production is planned only in areas classified as suitable for such production. Because BLM-administered lands and some National Forests tend to be grasslands and shrublands, the general management perspective is to produce forage for livestock grazing, wildlife, and wild horses at or near levels when plans were approved. In general, most lands are open and accessible for mineral and energy resource exploration and development.

Alternative 2 applies recent interim direction as the long-term strategy for lands managed by the Forest Service or BLM. The interim direction was developed to retain options for management of affected Federal lands while this environmental impact statement was being developed. Specific direction is described in the following decision notices:

- Implementation of Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH), February 24, 1995; Applies to all Bitteroot, Clearwater, Nez Perce, Boise, Challis, Payette, Salmon, and Sawtooth National Forests, and Upper Columbia, Salmon, and Clearwater BLM Districts.
- Inland Native Fish Strategy (INFISH), July 28, 1995. Applies to all National Forests in Idaho except the Bridger-Teton and Targhee and applies to BLM-administered lands in Idaho and Montana for bull trout.

The interim direction emphasizes protection and maintenance of aquatic, riparian, and wildlife resources while using conservative approaches to management. Direction for PACFISH and INFISH does not overlap. All other direction from current plans (Alternative 1) would also continue into the future; the direction described in Alternative 1 applies to those areas not covered by interim direction.

Under Alternative 2, forestlands and rangelands managed by the Forest Service and BLM continue to provide a mix of natural resource-based goods and services. On forestlands not subject to timber management activities,

Table S-2. Management Emphases for Alternative 2 (Project Area).

	% of All Forest Clusters	Forest Cluster No.	% of All Range Clusters	Range Cluster No.
Management Emphasis				
Conserve	43	1, 2, 6	33	2, 3
Conserve/Restore	26	5	NA	NA
Produce/Conserve	31	3, 4	67	1, 4, 5, 6

desired future conditions are also the same as described in Alternative 1. On areas subject to timber management and/or areas within designated riparian areas in key/priority watersheds, some differences in desired range of future conditions from Alternative 1 apply.

Features Common to Alternatives 3 through 7

Goals were the foundation for developing alternatives. They are broad general statements of intent that are neither quantified nor time-specific. A set of goals common to Alternatives 3 through 7 was developed from the Purpose and Need because it is recognized that any ecosystem management strategy must simultaneously achieve a number of common conditions and outcomes. Alternatives 3 through 7 would address each goal to varying degrees.

Goal 1. Sustain and where necessary restore the health of forest, rangeland, aquatic, and riparian ecosystems.

Goal 2. Provide a predictable, sustained flow of economic benefits within the capability of the ecosystem.

Goal 3. Provide diverse recreational and educational opportunities within the capability of the ecosystem.

Goal 4. Contribute to recovery and de-listing of threatened and endangered species.

Goal 5. Manage natural resources consistent with treaty and trust responsibilities to American Indian tribes.

Alternative 3 updates existing Forest Service and BLM land-use plans in response to changing conditions (such as declining forestland and rangeland health, local economies at risk, and declining salmon runs), while minimizing changes to local plans and relying on local public needs and desires. Each National Forest or BLM District would emphasize local public input to determine a desired mix of uses, services, restoration and management actions consistent with ecosystem principles to incorporate into the land-use plans. Direct involvement with State, county, and tribal governments will be used in planning, decision-making, and implementation of programs.

The emphasis in this alternative is to make minimal modification to existing plans to allow them to be more effective, integrated, and consistent in the face of changed ecological conditions and increasing numbers of appeals and lawsuits. Only those priority conditions that most hinder the effectiveness of existing plans are addressed in this alternative and distinguish it from the No Action Alternative (Alternative 1). This alternative provides a broader dimension and more integrated management direction regarding priority large-scale issues that cross administrative boundaries than do Alternatives 1 or 2.

Alternative 4 is designed to aggressively restore ecosystem health, the results of which would resemble endemic disturbance processes including insects, disease, and fire. The alternative focuses on short-term vegetation management to improve the likelihood of moving towards or maintaining ecosystem processes that function properly in the long-term. Vegetation management is designed to reduce risks to property, products, and economic and social opportunities that can result from large disturbance events. Direct involvement with State, county, and tribal governments will be used in planning, decision-making, and implementation of programs.

The priority in this alternative is placed on forestland, rangeland, and watershed health,

Table S-3. Management Emphases for Alternative 3 (Project Area).

	% of All Forest Clusters	Forest Cluster No.	% of All Range Clusters	Range Cluster No.
Management Emphasis				
Conserve	NA	NA	8	2
Conserve/Restore	28	1, 6	25	3
Restore	54	2, 3, 5	19	5
Restore/Produce	18	4	48	1, 4, 6

Table S-4. Management Emphases for Alternative 4 (Project Area).

	% of All Forest Clusters	Forest Cluster No.	% of All Range Clusters	Range Cluster No.
Management Emphasis				
Conserve/Restore	10	1	8	2
Restore	90	2, 3, 4, 5, 6	92	1, 3, 4, 5, 6

assuming that healthy streams, wildlife populations, and economic and social benefits will follow. Actions taken to achieve desired conditions are designed to produce economic benefits whenever practical. A wide variety of management tools are available under this alternative.

Alternative 5 emphasizes production of goods and services at the sub-regional level consistent with the principles of ecosystem management. Biological capability and economic efficiency are used to determine relative priority uses for an area, rather than local demands and traditional uses. Areas that are best able to produce products, goods or services, or desired conditions are targeted to do so within the ecological capability of the area. Other uses also are expected to exist when they do not conflict with or diminish the priority uses. While a full range of conditions, products, and services may not be provided in all localities, the desired range of conditions, products, and services will be met on a regional (project area) basis. Direct involvement with State, county, and tribal governments will be used in planning, decision-making, and implementation of programs.

In this alternative, the EIS team identified areas best able to produce products, goods, services, or desired conditions, within the ecological capability of the land. Five resource priorities were considered: timber, livestock, aquatic resources, wildlife, and recreation. The assumption used in building this alternative was that each forest and range cluster has a primary management priority and some have a secondary priority. Other uses are likely to occur, but any conflicts would be resolved in favor of the priority uses.

Alternative 6 emphasizes an adaptive management approach to restore and maintain ecosystems and provide for the social and economic needs of people. While much knowledge of natural resource management has been acquired through experience and research, ecosystems are complex, and knowledge of the functions and processes that make up ecosystems is limited. Management strategies will be adjusted based on information gained from continued research and monitoring of ecological, social, and economic conditions and from direct input from state, county, and tribal officials.

Table S-5. Management Emphases and Priorities for Alternative 5 (Project Area).

	% of All Forest Cluster	Forest Cluster No.	% of All Range Cluster	Range Cluster No.	Forest Cluster Priority	Range Cluster Priority
Management Emphasis						
Conserve	10	1	7	2	Recreation/Aquatics	Recreation/Aquatics
Conserve/Restore	15	2	25	3	Aquatics/Recreation	Recreation/Wildlife
Restore	39	3, 5	NA	NA	Aquatics/Timber/ Livestock	NA
Restore/Produce	18	6	35	1, 6	Wildlife/Recreation	Livestock/Timber/ Wildlife
Produce	18	4	NA	NA	Timber/Wildlife	NA
Produce/Conserve	NA	NA	33	4, 5	NA	Wildlife/Livestock/ Recreation

Table S-6. Management Emphases for Alternative 6 (Project Area).

	% of All Forest Clusters	Forest Cluster No.	% of All Range Clusters	Range Cluster No.
Management Emphasis				
Conserve/Restore	28	1, 6	52	2, 3, 5
Restore	72	2, 3, 4, 5	48	1, 4, 6

This alternative is similar to Alternative 4 but takes a slower, more cautious approach; implies the use of experimental processes, local research, and extensive monitoring; is expected to take longer to reach desired conditions; and has built-in uncertainty over which management actions will prove to be the most effective.

Under this alternative, actions are implemented on a broad-scale basis only when previous monitoring results or scientific research demonstrate that the actions are effective in achieving desired outcomes. Restoration activities that are well studied and well understood are pursued as actively under Alternative 6 as under Alternative 4. Priorities for restoration are generally in high hazard or high risk areas with high or moderate potential for success.

Alternative 7 emphasizes reducing risk to ecological integrity and species viability by establishing a system of reserves on lands administered by the Forest Service or BLM. Reserves are located to include all representative vegetation types and are large enough so natural process can occur without the influence of humans and still maintain the communities they were selected to represent. The level of human use and management is very low within the reserves. When disturbance events occur, actions are taken to reduce the likelihood of the event extending beyond the boundary of the reserve. Management of reserves is focused on long-term maintenance of natural processes and conditions with which plant and animal species have evolved. Most restoration activities occur on lands managed by the Forest Service or the BLM outside reserves, although restoration actions are taken within reserves where there is a high risk for events occurring in the short term that would preclude achieving desired outcomes in the long term. Management outside the reserve boundaries includes an emphasis on conserving remaining old forest stands and roadless areas larger than 1,000 acres. Direct involvement with State, county, and tribal governments will be used in planning, decision-making, and implementation of programs.

Reserves were selected for their representation of vegetation and rare animal species. No commercial timber harvest is permitted inside reserves, but limited silvicultural activities are allowed to enhance species viability. Livestock grazing is strictly limited to improve the long-term conditions for which the reserve was established. Dispersed, low-impact recreation use is allowed, including hunting and fishing, as long as these activities do not affect populations or habitats of rare species.

An emphasis of Alternative 7 is to restore fire as a natural disturbance process. However, limited management efforts may occur for some

Table S-7. Management Emphases for Alternative 7 (Project Area).

	% of All Forest Clusters	Forest Cluster No.	% of All Range Clusters	Range Cluster No.
Management Emphasis				
Conserve	43	1, 2, 6	52	2, 3, 5
Conserve/Restore	57	3, 4, 5	48	1, 4, 6

conditions where human action is considered necessary to achieve objectives of the reserves. The areas outside the reserves, sometimes referred to as the matrix, will be generally managed more actively.

Objectives and Standards

An index to the objectives and standards for the alternatives is included here. The full description of this management direction can be found in Table 3-5 in Chapter 3.

Management Activities Summary

Tables S-8 and S-9 summarize the levels of management activity that the EIS team assumed would occur in the first 10 years across the UCRB planning area. These numbers were derived by applying rule sets developed by the EIS team to the results of a vegetation succession model (CRBSUM) used for the Interior Columbia Basin Ecosystem Management Project.

Table S-8. Management Activities in Forest Clusters (UCRB Planning Area).

Alternative	Harvest	Thin Burning	Prescribed Restoration	Watershed
			Acres (thousands per decade)	
1	1125-1525	640-860	525-715	320-435
2	470-635	510-690	525-715	715-965
3	785-1065	850-1150	1040-1410	715-965
4	725-975	1085-1465	1575-2130	1075-1455
5	935-1265	915-1235	915-1235	725-980
6	445-605	935-1265	1295-1755	910-1230
7				

Table S-9. Management Activities in Range Clusters (UCRB Planning Area).

Alternative	Livestock Management	Improve Rangelands	Prescribed Burning	Riparian Restoration
			Acres (thousands per decade)	
1	425-575	270-370	205-275	35-45
2	1250-1690	270-370	205-275	35-45
3	1250-1690	815-1105	465-625	100-140
4	2210-2990	990-1340	465-625	100-140
5	1250-1690	475-645	210-280	100-140
6	2210-2990	475-645	465-625	100-140
7	710-960	270-370	460-620	60-80

Index to Objectives and Standards in Table 3-5

Implementing Ecosystem Management

EM-O1 **Implement ICBEMP using multi-scaled hierarchical analysis**
EM-O2 **Implement ICBEMP using collaborative intergovernmental approach**

Subbasin Review

EM-O3 **Conduct brief sub-basin reviews**
- EM-S1 Complete sub-basin reviews within 1-3 years
- EM-S2 Things to consider during sub-basin review
- EM-S3 Collaborative, interagency sub-basin review shall prioritize EAWS
- EM-S4 Use sub-basin review for EAWS and land use plan revisions

Ecosystem Analysis at the Watershed Scale

EM-O4 **Conduct ecosystem analysis at the watershed scale (EAWS)**
- EM-S5 Federal Guide for EAWS shall be used
- EM-S6 Line officers shall set the scope of EAWS
- EM-S7 Category 1 sub-basins EAWS "trigger"
- EM-S8 Listed, Proposed, Candidate species EAWS "trigger"
- EM-S9 Low road density EAWS "trigger"
- EM-S10 Large blocks of native rangeland EAWS "trigger"
- EM-S11 Screening process to exempt activities from EAWS
- EM-S12 Four-year transition period in Category 2 and 3 sub-basins
- EM-S13 Restrictions on modifying standards, including RMOs and RCAs
- EM-S14 Use EAWS to provide context for land management activities

Physical Environment

Soil Productivity

PE-O1 **Maintain soil productivity**
PE-O2 **Maintain riparian soils to ensure high quality water**
PE-O3 **Develop soil productivity protection and restoration programs**
PE-O4 **Restore and maintain nutrient cycling**
- PE-S1 Recommendations for managing coarse woody debris
- PE-S2 Recommendations for amounts of coarse woody debris after wildfire
- PE-S3 Recommendations for large diameter standing live and/or dead wood

Air Quality

PE-O5 **Protect air quality/comply with Clean Air Act requirements**
- PE-S4 Assess management activities that may affect air quality

Terrestrial Strategies

TS-O1 **Maintain and promote native plant communities**
- TS-S1 Maintain or improve native plant communities

Fire Disturbance Processes

TS-O2 **Restore fire as natural disturbance process**
TS-O3 **Rehabilitate disturbed areas**
- TS-S2 Rehabilitate/revegetate disturbed areas with ecologically appropriate species
- TS-S3 Use native species in rehabilitation seedings
- TS-S4 Rest burned areas from grazing to maintain soil productivity

Index to Objectives and Standards in Table 3-5 (continued)

Noxious Weeds

TS-O4 **Manage noxious weeds across jurisdictional/political boundaries**
- TS-S5 Implement IWM strategy/ 7 steps of strategy
- TS-S6 Implement IWM strategy on forest lands

TS-O5 **Implement IWM strategy on rangelands**
- TS-S7 Implement steps of IWM strategy, Range Clusters 2 (alts 3,4,&7 outside); 2 and 4 (alt 5); and 2,3,&5 (alt 6)
- TS-S8 Implement steps IWM strategy, Range Clusters 3 (alts 3 & 5); and 1,3,4, 5& 6 (alt 4)
- TS-S9 Implement steps IWM strategy, Range Cluster 5 (alt 3 & 5)
- TS-S10 Implement steps IWM strategy, Range Clusters 1,4,&6 (alt 3&7 outside); 1&6 (alt 5); 1,3,4,5,&6 (alt 6)

Forest Lands

Dry Forest

TS-O6 **Restore ecosystem processes /Dry Forest**
- TS-S11 Increase ppine and wlarch in mature/old single & multi-story forests
- TS-S12 No harvest of dominant or co-dominant ppine outside reserves
- TS-S13 No silvicultural treatments in mature/old forests outside reserves
- TS-S14 No commercial harvest in dry forest terrestrial reserves

TS-O7 **Manage suitable lands to produce commodities/maintain ecosystem**

Moist Forest

TS-O8 **Restore ecosystem processes /Moist Forest**
- TS-S15 Maintain viability of and increase western white pine
- TS-S16 Plant blister-rust-resistant stock/increase western white pine
- TS-S17 Increase dominance of early successional, shade-intolerant species
- TS-S18 No harvest of dominant or co-dominant ppine outside reserves
- TS-S19 No silvicultural treatments in mature/old forests outside reserves
- TS-S20 No commercial harvest in moist forest terrestrial reserves

TS-O9 **Manage suitable lands to produce commodities/maintain ecosystem**

Cold Forest

TS-O10 **Restore ecosystem processes /Cold Forest**
- TS-S21 Maintain viability of/increase whitebark pine and subalpine larch

TS-O11 **Manage suitable lands to produce commodities/maintain ecosystem**

Rangelands

TS-O12 **Restore or maintain rangeland health**
- TS-S22 Implement strategies to maintain/restore watershed function
- TS-S23 On dry shrublands, manage grazing during/after drought years

TS-O13 **Produce livestock forage while restoring ground cover and productivity**

TS-O14 **Reduce encroachment of junipr, conifers, and sagebrush**

TS-O15 **Restore dry grass/dry shrub/cool shrub**
- TS-S24 No livestock grazing in reserves
- TS-S25 No range improvement projects in reserves

TS-O16 **Produce livestock forage and conserve cool shrub/dry shrub/dry grass**

Aquatic/Riparian Strategies

AQ-O1 **Emphasize riparian and aquatic processes and functions**

AQ-O2 **Maintain high quality aquatic and riparian habitat**

AQ-O3 **Protect high quality waters and identify and maintain habitats**

AQ-O4 **Category 1 sub-basins: Maintain watersheds**

AQ-O5 **Restore watersheds where they have been degraded**

AQ-O6 **Implement watershed restoration activities based on priorities**

Index to Objectives and Standards in Table 3-5 (continued)

Index to Objectives and Standards in Table 3-5 (continued)

	AQ-S39	Revoke conveyance permits for those without state water rights
	AQ-S40	All water conveyance intakes shall meet established standards
	AQ-S41	Conveyance permits require best methodology to conserve water
	AQ-S42	Hydroelectric ancillary facilities to not prevent attainment of RMOs
	AQ-S43	New developments that may adversely affect RCAs not permitted
	AQ-S44	Leases, permits, etc., to avoid effects inconsistent with attainment of RMOs

Additional Riparian Management

	AQ-S45	Eliminate or reduce risks from transport of toxic chemicals
	AQ-S46	Develop contingency plans for chemical spills or contamination
	AQ-S47	Herbicides etc. to not retard or prevent attainment of RMOs
	AQ-S48	Prohibit storage of fuels and toxicants within RCAs
	AQ-S49	Locate water drafting sites to avoid adverse effects on aquatics
AQ-O11	**Manage grazing in wetlands to prevent impairment of functions**	
AQ-O12	**Minimize disturbance to redds for candidate & sensitive species**	
	AQ-S50	Manage livestock to prevent disturbance to redds for T,E,P species
	AQ-S51	Manage livestock to minimize impacts on redds for C & S species

Water Quality

AQ-O13	**Maintain and improve water quality**	
	AQ-S52	Maintain water quality in Outstanding Resource Waters
	AQ-S53	Comply with state or tribal anti-degradation requirements
	AQ-S54	Comply with TMDLs in Water Quality Limited segments
	AQ-S55	Incorporate state WQLS priority lists into intergovernmental prioritization process
	AQ-S56	Adjust activities to meet water quality standards
AQ-O14	**Develop management actions supported by EAWS to restore WQLS**	

Terrestrial and Aquatic Species and Habitats

HA-O1	**Restore and/or maintain and habitat conditions**	

Viable populations

HA-O2	**Provide habitat for viable populations, recovery of listed spp, social needs**	
	HA-S1	Manage habitats for long-term viability, especially edge of range
	HA-S2	Management to restore vegetation composition, linkage, patch size
	HA-S3	Restore/maintain habitats for free movement between habitat blocks
	HA-S4	Improve/restore linkages at known habitat bottlenecks
	HA-S5	Develop mature/old forest structural definitions
	HA-S6	Analysis and strategies for mature/old structure stands
	HA-S7	Use local analysis to develop snag levels
	HA-S8	Use local analysis to develop downed wood levels
	HA-S9	Manage firewood programs consistent with snag and downed wood standards
	HA-S10	Restore mountain mahogany, bitterbrush, quaking aspen
	HA-S11	Restore native plants on important wild ungulate winter range
	HA-S12	Protect bat roost sites and hibernacula

Protection/Restoration of Listed Species Habitats

HA-O3	**Restore or protect habitat for listed species; manage habitat to prevent listing**	
	HA-S13	Manage habitats to recover special status species, prevent listings
HA-O4	**Manage rangelands for special status species habitat requirements**	
HA-O5	**Provide for continued existence and long-term conservation of species**	

Recovery of Federally Listed Aquatic and Terrestrial Species

HA-O6	**Contribute to range-wide recovery of federally listed or proposed species**	
	HA-S14	Implement recovery plans, document departures
	HA-S15	Apply standards & guides from recovery documents for raptors
	HA-S16	Adopt IGBC grizzly bear resource management guidelines/situations

Index to Objectives and Standards in Table 3-5 (continued)

	HA-S17	Management activities consistent with IGBC access management recommendations
	HA-S18	Habitat mapping/cum effects in high road density recovery areas
	HA-S19	Evaluate IGBC strategy for reducing grizzly bear mortalities, Selkirk and Cabinet/ Yaak

Wildlife and Livestock Conflicts

HA-O7	**Management practices to reduce conflicts: livestock / carnivores & bighorn / domestic sheep**	
	HA-S20	Minimize conflicts between carnivores and livestock mgt. practices
	HA-S21	Reduce potential disease transmission between bighorn / domestic sheep

Human Uses and Values

Collaboration

HU-O1	**Foster support of decisions by promoting collaboration - broad range**	
HU-O2	**Foster support of decisions by promoting collaboration - intergovernmental**	
	HU-S1	Initiate MOU to offer advice to federal land managers

Economic Activity

HU-O3	**Derive soc/econ benefits, promote commercial activities**	
HU-O4	**Efficiently deliver goods and service from FS/BLM-administered lands**	
HU-O5	**Minimize large annual shifts in commercial activity**	
HU-O6	**Emphasize customary economic uses in rural communities**	
HU-O7	**Contribute to economic diversity/local economic development goals**	
HU-O8	**Collaborate with local entities for compatibility of land uses**	
HU-O9	**Reduce risk of life/property loss due to wildfire; decrease costs**	
	HU-S2	Involve locals in development of coordinated fuel management plans

Recreation Opportunities

HU-O10	**Supply recreation opportunities consistent with public policies/abilities**	
	HU-S3	Use ROS to meet recreation management goals
HU-O11	**Identify opportunities to provide public access for recreation**	
HU-O12	**Foster and strengthen partnerships to manage facilities & services**	
HU-O13	**Meet visual quality objectives**	
HU-O14	**Maintain or enhance scenic integrity**	

Cultural Resources

	HU-S4	Survey and evaluate significance of federal lands for cultural resources
	HU-S5	Evaluate and nominate sites to NRHP
	HU-S6	Assess site-specific projects for effects on cultural resources

Transportation and Utility Corridors

HU-O15	**Ensure reliable and buildable utility corridors**	
	HU-S7	Use 1993 Western Regional Utility Corridor Study as reference
HU-O16	**Ensure access essential for corridor infrastructure maintenance**	
	HU-S8	Provide access to and maintenance of existing utility ROW
HU-O17	**Encourage integrated ROW vegetation management to minimize impacts**	

Federal Trust Responsibility and Tribal Rights and Interests

Government-to-Government Cooperation and Relations

\TI-O1	**Maintain government-to-government relationship with affected tribes**	
	TI-S1	Use consistent approach to government-to-government consultation
	TI-S2	Agreements with tribal governments regarding repatriation procedures
	TI-S3	Recognize tribal management efforts and work cooperatively

Index to Objectives and Standards in Table 3-5 (continued)

	TI-S4	Cooperate with tribes to restore/research treaty/trust resources
TI-O2		**Assess sense of place and incorporate into management**
	TI-S5	Complete place assessments as part of ecosystem analysis

Habitat Conditions

TI-O3	**Recognize native plant communities as traditional resources**	
	TI-S6	Establish programs for restoration/maintenance of native plant communities
	TI-S7	Provide habitat conditions to support harvestable resources
	TI-S8	Consider protection/restoration of treaty resources on ceded lands
	TI-S9	Assess habitat where it has social/ traditional importance
	TI-S10	Adopt aquatic conservation strategy
	TI-S11	Least restrictions on tribes to implement ESA conservation measures

Road Management

RM-O1 **Cooperate with partners on road design, operations, maintenance**

Road-related Adverse Effects

RM-O2	**Reduce road-related adverse effects**	
	RM-S1	Reduce road-related adverse effects
	RM-S2	Timber and livestock priority areas: management actions to not increase erosion, sediment
	RM-S3	Conduct Road Condition/Risk Assessment
	RM-S4	Develop or revise Access and Travel management plans
	RM-S5	Reduce effects on aquatic, riparian, terrestral species and habitats
	RM-S6	Determine habitat effectiveness ratings to reduce risk caused by human access
	RM-S7	Design and improve culverts to accommodate 100-year floods

Road Density

RM-O3	**Reduce road density where roads have adverse effects**	
	RM-S8	Decrease road miles in High and Extreme road density classes
	RM-S9	Use existing transportation networks in High & Extreme classes

Road Construction

RM-O4	**New road construction to prevent or minimize adverse effects**	
	RM-S10	Roads and landings should be outside RCAs
	RM-S11	Timber and livestock priority areas: no roads within 150' of active channel margins
	RM-S12	Maintain/restore fish passage, spawning, etc.
	RM-S13	Avoid high hazard areas, prevent sediment delivery to streams and RCAs
	RM-S14	Prohibit side casting in RCAs
	RM-S15	Don't increase road density by more than one density class in areas with none/low/ very low road densities
	RM-S16	No road construction in reserves or unroaded areas > 1,000 acres

Adaptive Management / Monitoring

Adaptive Management

AM-O1	**Make appropriate adjustments in management strategies**	
	AM-S1	Use adaptive management principles
	AM-S2	Adjustments to 'reserve' boundaries

Monitoring

AM-O2	**Monitor changes in conditions and take action to meet ecosystem managment goals**	
	AM-S3	Develop integrated intergovernmental monitoring and evaluation protocol
	AM-S4	Implement annual monitoring programs at various scales

Index to Objectives and Standards in Table 3-5 (continued)

Accountability

Environmental Consequences

The Science Integration Team (SIT) was directed by the Project Charter to assess, based on the best information available, the tradeoffs, consequences, outcomes, and interactions associated with each alternative. To the extent possible, the evaluations linked the biological, cultural, social, and economic concerns at various scales. The EIS team developed the array of alternatives and a set of evaluation criteria based on the Purpose and Need statement, the issues, and the goals. Outcomes of each alternative were evaluated relative to (a) maintaining and/or restoring forest, rangeland, riparian, and aquatic health and productivity; (b) maintaining economic, social, and cultural systems; and (c) contributing to meeting Federal trust responsibilities to American Indian tribes.

Summary of Key Effects and Conclusions

A summary of key effects on and conclusions for various elements of the ecosystem follows. These consequences are predicted to occur if the alternatives were implemented.

Physical Aspects of the Ecosystem

Soils and Soil Productivity

- In forestlands, Alternative 6 has the highest likelihood of reducing soil disturbances from current, followed closely by Alternatives 4 then 3, then by Alternatives 5, 2, 7 and 1. Because of the uncertainty associated with Alternative 7, reduction of soil disturbance could range from low to high, and could trend towards high in the long term. In rangelands, Alternative 3 has the highest likelihood of reducing soil disturbance from current, followed closely by Alternatives 5 and 6, then 4. Alternative 7 has a moderate likelihood of reducing soil disturbance from current, followed by Alternative 2. Alternative 1 is likely to increase soil disturbance from current levels, due largely to the increase in exotic plant invasion. Alternative 7 would have the highest likelihood of restoring floodplain and riparian soil functions in rangelands because the level of grazing disturbance would be about half that of the other alternatives. Actual effects on soil productivity from soil disturbance will depend on the type, extent, and method of disturbance, and existing condition of the soil and vegetation — all factors that cannot be adequately characterized at this scale.
- Alternatives 4 and 6 would have a higher likelihood of restoring and conserving organic matter and woody material to the soil ecosystem than the other alternatives because of the required minimum levels of coarse woody debris, and standing and downed large trees. Alternative 7 (inside reserves) would have highly variable levels of organic matter and wood because of unpredictable fire effects, but levels are expected to approach minimum requirements, particularly in the long term. Alternatives 3 and 5 are less likely to restore and conserve organic matter and woody material needed for sustainable soil productivity because of lower required minimums and the lack of large standing and downed trees. Amounts of organic matter and wood in Alternatives 1 and 2 are generally unspecified, and areas where soil productivity has declined due to loss of organic matter and coarse wood may continue to decline because of overall lack of consideration of soil requirements.
- Vegetation conditions similar to natural or historical range of variability, are more likely to maintain a stable and available nutrient supply, and thus sustain soil productivity and reduce risk of nutrient loss from uncharacteristic fire. Alternatives 3, 4, 5, and 6 are likely to result, more quickly, in achieving vegetation conditions similar to the historical range of variability, both in the short term and long term. An exception is Alternative 3, which may show greater departure of some forested landscapes from the historical range of variability. Alternatives 1, 2, and 7 have less emphasis than the other alternatives in achieving vegetation conditions similar to the historical range of variability, and consequently are less likely to result in

sustainable soil and nutrient conditions; while Alternative 7 is fairly similar to Alternatives 3 through 6 in rangelands, it would not be as effective in reducing exotic weeds. Alternatives 1 and 2 would likely result in continuing and increasing departures of forested landscapes from the historical range of variability in forestlands and would not be effective in arresting the spread of exotics in rangelands.

- Alternative 4 provides the highest levels of watershed restoration and road closures that would restore hydrologic and soil function. Alternative 3, followed by Alternative 6, then Alternative 5 have fairly high levels of restoration focused at restoring hydrologic and soil function. Alternative 7 has high levels of road closures, but because it takes a more passive approach to restoration, it is anticipated that the majority of closures would only block access and, therefore, may present a higher risk to soil and hydrologic function in the short term than if they remained open. Alternative 5 would result in less watershed restoration and road closures that restore hydrologic and soil function than Alternatives 3, 4, 6, and 7; Alternatives 1 and 2 would have much lower levels than the other alternatives. Consequently, Alternatives 1 and 2 are not expected to improve soil and hydrologic function where it has declined. Where watershed and road restoration is focused in riparian areas, and where riparian vegetative cover is increased, floodplain and riparian area soils are most likely to improve.

Air Quality

- The dispersion modeling assessment indicates that there may be significantly greater impacts from wildfires than from prescribed burning. However, due to limitations of this analysis, comparison of the model estimates with the National Ambient Air Quality Standards is not possible. Compliance of prescribed burning impacts with the National Ambient Air Quality Standards should be evaluated at a subsequent planning level.
- Increased haziness (a reduction in viewing distance and ability to detect finer features on the landscape) would likely result from the increases in prescribed burning proposed in Alternative 3 through 7. Large wildfires result in more of the project area affected by haze. It can be inferred that the higher concentrations of emissions associated with these wildfires would reduce visibility in affected areas more so than the highest levels of prescribed fire. However, a higher frequency of visibility impacts would result from prescribed fire than wildfire.
- Other criteria pollutants are not likely to have an impact on public health because of the small levels produced and the rapid dilution or modification of these substances within relatively short time frames. However, the potential effects of air pollutants impacting plants and animals on public lands could be mitigated by managing to minimize stress and through monitoring. The effects of alternatives on landscape health provide an indicator for reducing stress on plant and animal habitats with Alternatives 3, 4, 6, and 7 having the greatest ability, and Alternatives 1, 2, and 3 providing almost no improvement in landscape health that would reduce stress. Monitoring and prediction of potential effects with feedback to the EPA would be best addressed under Alternatives 6, 4, and 3 respectively, with 7 and 5 at moderate levels, and 2 and 1 at the lowest levels.

Terrestrial Aspects of the Ecosystem

Effects on Trends in Forested Terrestrial Communities

- Overall, Alternatives 4 and 6 would be most effective in changing forest conditions to a more desirable pattern of forest structural stages and composition. They would reverse these current undesirable trends: high amounts of mid-seral in the dry and moist forests, high amounts of late-seral multi-layer in the dry and moist forests, less late-seral single-layer in the dry forests, fewer large trees and shade intolerant species. Alternatives 3 and 5 would have slower transitions than Alternatives 4 and 6. They would be less effective in restoring desirable structure and composition on the landscape. Alternatives 1, 2, and 7 would be the least effective overall in reversing current declining trends in forest health.

Effects on Trends on Forestlands

- ◆All alternatives would reduce the amount of mid-seral in the moist forests and move it within historical range of variability in the long term. Alternatives 3, 4, and 6 would have the greatest reductions.
- ◆All alternatives would reduce the amount of late-seral multi-layered moist forest and move within historical range of variability in 100 years. Alternatives 1 and 5 would show greatest reductions but differences among alternatives would be small.
- ◆All alternatives would increase the late-seral multi-layered cold forest to within historical range of variability in the short and long terms. Alternatives 1, 2, 6, and 7 would show the greatest increases but differences among alternatives would be small.
- ◆All alternatives would increase the late-seral single-layer dry forest in the long term. Alternatives 3 and 4 would have the greatest increases due to restoration of late-seral multi-layered forest, followed by Alternatives 5 and 6.
- ◆Alternatives 1 and 2 would lead to reductions in interior ponderosa pine, western larch, and western white pine.
- ◆Alternatives 3 through 7 (outside reserves), would lead to increases in interior ponderosa pine, western larch, western white pine, and large tree components in the short and long term.

Effects on Trends Toward the Desired Range of Future Condition in Forested Potential Vegetation Groups

- ◆In the long term, forested potential vegetation groups would move toward their desired range of future condition more effectively under Alternatives 3, 4, 5, and 6, than under Alternatives 1, 2, and 7.

Effects on Successional and Disturbance Processes Across the Project Area

- ◆In Alternatives 1, 2, and 5 (in timber priority areas), young forest structures would tend to be relatively more uniform in spacing and size, with smaller patch sizes and lower representation of large tree components than for Alternatives 3, 4, 6, and 7.
- ◆Alternatives 4 and 6 would result in young, mid-seral, and late-seral forest structures, composition, and disturbance patterns that are more similar to historical conditions than the other alternatives. These alternative would be the most successful in restoring western larch, western white pine, interior ponderosa pine, whitebark pine, alpine larch, and large tree components.
- ◆Alternatives 3 and 7 (outside reserves) would result in a mixture of uniform and non-uniform tree size and spacing in the young forest stage. Alternative 7 (inside reserves) would result in uncharacteristically large patch sizes of young forest in the short term.
- ◆Alternatives 1 and 2 would have more forests move from late-seral to mid-seral, and from mid-seral and late-seral single-layer to late-seral multi-layer forest structure than the other alternatives. These alternatives would result in forest structures and compositions that are most dissimilar to historical conditions.
- ◆Alternatives 3 through 7 (outside reserves) would have higher transitions of mid- seral and late-seral multi-layer to late-seral single-layer in the dry forests than the other alternatives.

Effects on Insects and Disease

- ◆Alternatives 1, 2, and 7 would produce forest structure and composition with the highest susceptibility to insects and disease.

Effects on Fire Regimes

- ◆Under Alternatives 1, 2, and 7 the amount of wildfire in dry and moist forests would be less than historical levels but the amount of crown fire in dry forests would approximate historical levels. Alternatives 3, 4, 5, and 6 would have lower levels of wildfire than the other alternatives in all forested potential vegetation groups.

Rangelands

- ◆Alternatives 4 and 3 are predicted to be the most effective in reducing the spread of noxious weeds and cheatgrass on rangelands, in general, in the project area. Alternatives 6 and 7 would be the next

most effective, followed by Alternative 5, with Alternatives 2 and 1 being the least effective. No alternative was predicted to reduce the acres of infestations on dry grassland, overall. Alternatives 3 and 4 were predicted to decrease the acres of noxious weed infestations, in general, on the dry and cool shrublands. Differences among alternatives are due to differing management activity levels and the differing emphases of control efforts, related to the number of acres treated and the areas or range clusters and noxious weed species treated. Alternative 4 proposes the most acres of noxious weed control and the most emphasis of implementation of the IWM strategy; therefore, it is projected to be the most effective alternative with regard to noxious weeds and cheatgrass.

- Alternatives 4, 3, 6, and 5 are predicted to be the most effective in reducing the encroachment or density of woody species on rangelands, in general, in the project area. Alternative 7 would be the next most effective, and Alternatives 2 and 1 would be the least effective. It is predicted that Alternative 4 and possibly Alternative 3 would meet the desired range of future condition with regard to reducing woody species encroachment or density problems, generally. Differences among alternatives are due to differing management activity levels and differing emphases of control efforts, related to the number of acres treated and the areas or range cluster where acres were treated. Alternative 4 proposes the highest amounts of prescribed burning and harvesting of woody species; therefore it is predicted to be the most effective with regard to woody species encroachment or density.

- Alternatives 4, 3, and 6 are predicted to be the most effective in restoring acres of rangeland vegetation types, in general, in the project area. Alternative 7 would be the next most effective, followed by Alternative 5, with Alternatives 2 and 1 being the least effective. These alternatives would not have an effect of restoring rangeland vegetation types on non-Federal lands. The ranking of alternatives was based on the predicted ability of an alternative to restore rangeland vegetation types that have been taken over by noxious weeds or by woody species such as juniper on BLM- or Forest Service-administered lands. Reasons for this ranking are similar to those for noxious weeds and woody species control.

- Alternatives 4 and 6 would be predicted to be the most effective in reducing fragmentation and loss of connectivity on rangelands, in general, in the project area. Alternative 7 would be the next most effective, followed by Alternative 3, with Alternatives 5, 2, and 1 being the least effective. It is predicted that restoration activities would be undertaken under the action Alternatives (3 through 7) with consideration of fragmentation and connectivity issues prior to implementation of most restoration activities. Standards and guidelines would be the most effective in Alternatives 4 and 6 for reducing fragmentation and loss of connectivity with regard to implementing management actions that do not cause further problems and that reduce existing problems.

- Alternatives 4, 6, and 7 are predicted to be the most effective in restoring slow-to-recover rangelands (that are not infested with exotics), in general, in the project area. Alternative 3 would be the next most effective, followed by Alternative 5, with Alternatives 2 and 1 being the least effective. Restoration activities would be done through range vegetative improvements as well as livestock management improvements, which are the highest in Alternatives 3 and 4 for range improvements and highest in Alternatives 4 and 6 for livestock management improvements.

- Alternatives 7, 4, and 6 would be predicted to be the most effective in reducing wildlife displacement and vulnerability to mortality on rangelands, in general, in the project area. Alternative 3 would be the next most effective, followed by Alternative 5, with Alternatives 2 and 1 being the least effective. There would be predicted effects on road closure, road use, and human activity as a result of implementation of some alternatives, especially Alternative 7, which would be predicted to reduce wildlife displacement and vulnerability to mortality through reserves.

- The amount of wildfire is much less than historical levels because of fire suppression actions, with the exception of the dry shrub PVG in Alternatives 1, 2, and 7. For all

PVGs, Alternatives 3, 4, 5, and 6 have lower levels of wildfire than the other alternatives.

Terrestrial Species

- Currently there are 51 species in the UCRB planning area with unfavorable habitat outcomes (Outcome Class 4 or 5). Implementation of Alternatives 4, 6, and 7 would result in 32, 32, and 33 species with unfavorable habitat outcomes; and Alternatives 5, 3, 2, and 1 would result in 37, 38, 39, and 46 species with unfavorable outcomes.
- On average, Alternatives 4, 6, and 7 would provide the highest likelihood of species persistence and viability over the next 100 years. These alternatives emphasize restoration of habitats, which would likely reverse negative trends for most species because of improved management, riparian emphasis, and proposed activities that have varying degrees of positive effects on some habitats and species.
- Alternative 1 would result in the highest number of species with increased risk of extirpation or loss of viability because it lacks the increased emphasis on restoration of forest, rangeland, and riparian habitats of the other alternatives.
- Alternatives 4 and 6 would result in more species with improved likelihood of persistence and viability than with increased risks of extirpation, due to improved habitat condition through restoration of uplands and riparian emphasis.
- Alternatives 3 and 7 would result in an equal number of species with increased risks of extirpation and improved likelihood of persistence and viability, due in part to the intermediate levels of restoration in upland and riparian communities.
- Alternatives 1, 2, and 5 would result in more species with increased risk of extirpation than with improved likelihood of persistence and viability. Activity levels expected under these alternatives would result in higher levels of habitat modification, which is assumed to result in some risk to species.
- Human access and its direct and indirect effects on wildlife species are most appropriately addressed at finer scales. However, in relative terms, Alternatives 6 and 7 would result in lower levels of human activity and therefore lower impact levels. Alternatives 1 and 5 are predicted to have the highest levels of human activity and therefore the highest level of impacts to wildlife from access and related activities. Alternatives 2, 3, and 4 would result in intermediate levels of impacts associated with access.
- Grizzly bear and Columbian sharp-tailed grouse have undergone the greatest change in habitat conditions, based on a comparison of current and historical conditions. Both species were widely distributed historically, but currently their habitats and populations are reduced, isolated, and disjunct. Alternative 7 is the only alternative predicted to improve conditions for grizzly bear, due to the habitat conditions that large reserves would provide. Non-Federal lands will continue to limit populations of these species.
- Implementation of any alternative except Alternative 1 would result in improved chances of persistence and viability for some species ("increasers") (table 4-42).
- Implementation of any alternative would result in some risk of extirpation for some species because of cumulative effects on all lands ("decreasers") (table 4-43).
- Under Alternatives 1 and 5, if a species were trending toward extirpation based on the changes from historical to current conditions, that trend would be continued. In comparison, under Alternatives 4 and 6, predicted negative trends in habitat would tend to be stopped or slowed down.
- There would be little change in overall outcomes for the majority of species analyzed under any alternative. This result is based on current and projected future populations and habitat conditions, and on the fact that most species respond to habitat changes at finer scales than this evaluation portrays.
- None of the alternatives approach historical conditions (habitats or population) for the 118 vertebrate and 14 plant species analyzed. Loss of habitat both on and off Federal land contributes to this condition.
- Threatened and endangered plants have a risk of extirpation or viability loss,

primarily due to reduced habitat conditions and availability and to limited population sizes compared to historical conditions. The alternatives would not change this condition because many of the species are local endemics with little chance to expand habitat or populations and are difficult to analyze at this scale. However, protection will be provided for these species under provisions in the Endangered Species Act and recovery and conservation plans.

- Habitats of threatened and endangered wildlife species do not demonstrate a substantial change in any alternative at the broad scale of analysis. The one exception is the bald eagle, which shows an improved likelihood of persistence and viability under Alternatives 4 and 6 due to riparian emphasis.

- Major exceptions to this list of summary findings are those for woodland birds. Alternatives 4 and 6 would result in the least favorable outcomes for woodland birds, because of proposed reductions in extent of juniper woodlands (in which the reduced extent would more closely approximate the historical range of variability).

Aquatic Aspects of the Ecosystem

Effects on Aquatic Systems

- Specific outcomes (such as water quantity, water quality, instream and riparian area habitat conditions) from the alternatives pertaining to lakes, streams, rivers, and riparian areas and wetlands were not predictable without site-specific NEPA analysis.

- In Alternatives 1 and 2, ecosystem management would not be emphasized, and there would not likely be watershed-scale consideration and protection of hydrologic and riparian area/wetland processes and functions. This would likely result in continued degradation of lakes, streams, and rivers.

- In Alternatives 3 through 7, ecosystem management would be emphasized, thus facilitating management for multiple ecological goals and long-term ecological sustainability on a landscape basis. Ecosystem management would provide a mechanism to effectively prioritize activities and weigh multiple risks to various resources. Furthermore, ecosystem management direction in Alternatives 3 through 7 would more readily foster implementation of adaptive management and analysis of cumulative effects than the approaches of Alternatives 1 and 2. It is expected that these features of Alternatives 3 through 7 would aid in overall improvement in lakes, streams, rivers, and riparian areas and wetlands.

- Alternative 4, with its higher activity levels, could pose greater short-term risks to aquatic ecosystems than would the slower activity rates and amounts of Alternative 6 and the restrictive and passive approach of Alternative 7, although lack of watershed and road restoration in Alternative 7 could pose greater risks to aquatic ecosystems in the long term.

- Watershed restoration levels would be greatest for Alternatives 4 and 6 and are expected to result in greater long- and short-term benefits to lakes, streams, rivers, riparian areas, and wetlands compared to other alternatives. However, greater uncertainty would be associated with Alternative 4, because requirements for Ecosystem Analysis at the Watershed Scale are less and therefore the context to reduce risk and maximize potential benefits from restoration actions may not be provided.

- In Alternatives 3 through 7, adjustment of standards supported by Ecosystem Analysis at the Watershed Scale in concert with broad-scale planning and subbasin review would likely meet the intent of ecosystem management and integration of landscape, terrestrial, aquatic, and social objectives. Alternatives 4, 5, and 6 would offer more flexibility than Alternative 7 with respect to activities permitted in riparian areas and wetlands. Alternative 6 would provide the most management options because site-specific NEPA analysis could be used in some areas for up to four years to adjust ICBEMP standards. This adjustment process would maximize opportunities for adaptive management. Since less hierarchial analysis would be required in Alternative 4, implementation of restoration actions would occur faster than in other alternatives. However, uncertainty of meeting the intent of ecosystem management and integration of

objectives would be greater than Alternative 6 because of the lack of incentive to modify and integrate objectives and standards that fit watershed-scale processes and functions. There would also be risks associated with the lack of active landscape and watershed restoration in Alternative 7, especially in the long term.

- Alternatives 2 through 7 would adequately protect ecological functions within riparian areas and wetlands except for the timber priority areas of Alternative 5. Within timber priority areas of Alternative 5, the size of the riparian conservation areas would not likely be adequate to fully protect aquatic resources, primarily because of their limited widths and lack of protection for intermittent streams. Within livestock priority areas of Alternative 5 (including large parts of the Northern Great Basin, Columbia Plateau, and Owyhee Uplands ERUs), priority areas for protection of riparian areas would not be established. Even so, to meet proper functioning condition objectives within timber and livestock priority areas, degradation of riparian areas would cease and some restoration would begin.
- Alternative 1 would have no consistent planning-area-wide direction for riparian area protection and is predicted to not adequately protect riparian functions.

Effects on Aquatic Species

- The current composition, distribution, and status of most native fish species within the planning area would remain stable under Alternative 2 and remain stable or improve under Alternatives 3, 6, and 7. The greatest potential for improvement occurs with Alternatives 6 and 7. Alternative 4 has similar potential to benefit native species as Alternatives 6 and 7, but uncertainty in the ability to prioritize management actions and evaluate risks, coupled with high levels of activities, decreases confidence in successful ecological outcomes. Improvements in distribution and status are linked to levels of watershed and riparian restoration and other management activities within the species' current range. Most native fishes' distribution and status would continue to decline under Alternatives 1 and 5 inside timber and livestock priority areas due to inconsistent and inadequate riparian and aquatic protection measures in all or part of species' current ranges.
- Benefits of any alternative are linked to improved instream and riparian conditions resulting from better riparian management, higher levels of watershed and riparian restoration, and Ecosystem Analysis at the Watershed Scale. Successful ecological outcomes from Alternatives 4 and 6 depend on efficient prioritization of restoration actions and maximizing adaptive management to minimize risk. Alternative 7 could pose risks to isolated and fragmented populations because of the lack of active forest, rangeland, and watershed restoration, raising uncertainty about long-term improvements in the more depressed and fragmented portions of species' ranges.
- Alternatives 1, 2, and 5 would result in the continued decline in the overall status and distribution of steelhead and stream-type chinook salmon stocks due to a minimal emphasis on restoration and continued land disturbance in portions of the current range over the long term. None of the alternatives address the need for a comprehensive approach to alleviate mortality outside BLM- or Forest Service-administered lands to ensure persistence and viability of steelhead or stream-type chinook salmon stocks.
- Downstream stresses associated with the hydropower system are one of the major causes of declining Snake River anadromous fish populations (NPPC 1986; NMFS 1992). Federal efforts are underway to address these problems through increased spill, barging, and monitoring. Mid-Columbia anadromous stocks (for example, John Day and Deschutes Rivers) are influenced less by hydropower due to a lower number of dams below spawning and rearing areas. Maintenance of high-quality habitats is vital to the persistence of populations, but the magnitude of effects varies from subbasin to subbasin. In general, it remains important to restore degraded watersheds where habitat is most limiting to fish, to improve egg-to-smolt survival over current conditions. High-quality habitat alone, however, is no guarantee of increased persistence without a comprehensive approach that addresses

all mortality factors. Additional high quality habitat alone could increase abundance of individual fish, but it would not likely reverse current negative population trends in the short-term. Salmon population numbers in much of the interior Columbia Basin are far below what current habitat conditions could likely support under a scenario of increased downriver survival.

- None of the alternatives would be expected to measurably affect the habitat needs of ocean-type chinook salmon because they inhabit lower-elevation mainstem river habitats that are less responsive to Federal land management. Alternatives 6 and 7 have the most conservative approach and might result in some benefit to ocean-type chinook salmon if management actions improve water quality and quantity. None of the alternatives address the need for a comprehensive approach to alleviate mortality outside BLM- or Forest Service-administered lands to ensure persistence and viability of ocean-type chinook salmon stocks.

Human Uses and Values

- Alternatives involving substantial change from current direction, especially if different from conventional management strategies, would likely be less predictable in their outcomes in the short term. In the long term, predictability would improve as experience is gained and new strategies are proven effective. Alternatives 4, 6, and 7, which emphasize restoring ecosystems by managing for more desirable and predictable disturbance regimes, would likely experience less short-term predictability in the delivery of services so that long-term predictability is improved. Alternatives 1 and 2 may be more predictable in the short term but would result in future disturbance regimes that are less predictable. Alternatives 3 and 5 may lie somewhere in between.

- Active restoration actions at the wildland-urban interface to reduce fire-related risks may increase risk of unintended disturbances in the short term. This would apply especially to Alternatives 4, 3, and 6. With successful restoration results, long-term risk in these areas should drop below current levels. However, a policy of lowering risk at the wildland-urban interface through public investments by the Forest Service and BLM may encourage more private investments and incursions in this zone, which could further increase risks to people and property.

- The current trend in livestock grazing shows a decline of 7 percent per decade. Only Alternative 5 would be expected to lessen this decline. Alternatives 2, 3, 4, and 6 would show a slight additional decline, with little difference among them. Alternative 7 would show the greatest decline because of restricted livestock grazing in reserves.

- All the alternatives would show an increase in timber volume harvested relative to the past few years. Alternatives 3 and 5 would show harvest volume greater than the combined 10-year average harvest level. Alternative 5 would show timber harvest volume greater than the combined National Forest allowable sale quantity value.

- Alternatives 3, 4, 6 and 7 would establish an extensive network of Riparian Conservation Areas (RCAs) that would likely result in a reduction in the suitable timber base and long- term sustained yield on National Forests. The extent and configuration of RCAs could also constrain operations in areas available for timber production and forest areas targeted for restoration treatments.

- Planned restoration activities would generate jobs — fewer than wood products manufacturing but more than ranching. Alternatives 4, 3, and 6 would concentrate a larger proportion of total restoration investments (and jobs) at the wildland-urban interface (generally areas with high socio-economic resiliency) than other alternatives. It is inferred that economically vulnerable areas (low socio-economic resiliency) would benefit proportionally less (in terms of jobs) under these alternatives.

- Recreation opportunities on Forest Service- and BLM-administered lands in the project area would not vary measurably by alternative, but some trends are evident. A slight shift would be expected from primitive-type use to roaded natural-type use where areas with very low road densities experience more road

development. This outcome is most likely in Alternatives 1 and 5. There could be a small reduction in dispersed roaded recreation caused by road density reductions in Alternatives 3, 4, 5, and 6, with a substantial reduction in Alternative 7. There could be reduced opportunity for water-based recreation because of potential access restrictions associated with new standards for RCAs, especially in Alternatives 3 through 7.

- Changes in the economic resiliency of counties or communities resulting from implementing alternatives cannot be reliably predicted at this broad scale. The current cconomic vulnerability of counties can be determined and used to infer potential future effects. Areas identified as economically vulnerable (using a measure like socioeconomic resiliency) would benefit most economically from more management activities and from concentrating activities in these areas. Alternatives 1, 3, and 5 could be most responsive to this need. Economically vulnerable areas are expected to bear the most social and economic costs of changing land management strategies because they tend to be more economically reliant on employment in natural resource industries.

American Indians and Tribes

- Generally, Alternatives 3, 4, 6, and 7 would provide the best response to agency need for appropriate levels of government-to-government consultation (see table 4-60). This is expected given that Alternatives 1 and 2 would not address the inconsistencies in tribal consultation between agency units or emphasize a more effective consultation process as found in Alternatives 3 through 7. Also, Alternatives 5 and 7 would limit opportunities for consultation and access to agency policy-making by providing up-front structure to management decisions through identified priority or reserve areas. Alternatives 4, 6, and 7 appear to be most responsive to Federal trust responsibilties and tribal rights and interests, as these alternatives would provide highest levels of habitat consideration for trust resources.
- Alternative 5 would provide fewer opportunities for collaboration or consultation with tribes (table 4-60) because it makes decisions for management emphasis on different areas across the project area.
- Alternatives 3, 4, 6, and 7 would be most responsive to those issues of interest to tribes (table 4-61). This includes provisions for ethno-habitats and for culturally significant places and resources in management decisions. The collective reasons for this are based on how these alternatives would provide for: (a) a meaningful agency-tribal consultation process; (b) projections of ecological integrity trends; and (c) overall aquatic and terrestrial projections of identified tribal interest species' habitats rated for viability concerns.
- Tribes share an over-riding concern and interest for healthy functioning ecosystems in the project areas, and for land management that would provide biophysical trends toward their socially desired range of future condition (Table 4-62). Those alternatives that appear most responsive to such federal trust responsibilities and tribal rights and interests are Alternatives 3, 4, 6, and 7 as they would provide the highest levels of consideration for major ecosystem components, such as aquatic integrity; rangeland and forestland regulation processes, patterns, functions and structures; and hydrologic systems.
- The alternatives differ in the rate and degree at which trends in ecological integrity would occur due to a combination of factors including: (a) differing rates in application of aquatic and riparian habitat protections as found in Alternatives 2 through 7 and especially Alternatives 3, 4, 6, and 7; (b) method of land management activities; and (c) the primary factors contributing to composite ecological integrity and landscape ecology trends (see the Composite Ecological Integrity section). These would benefit most under Alternatives 3, 4, 6, and 7.

Effects on Ecological Integrity and Social/ Economic Resiliency

- Summing across all the Forest Service- and BLM-administered lands within the planning area shows that the alternatives would provide very different outcomes in overall ecological integrity trends.
- Alternatives 3, 4, 6, and 7 would show mostly upward trends over time. These alternatives have consistent aquatic/ riparian conservation strategies coupled with either passive or active restoration/ conservation management emphasis. Restoration actions would focus on restoring biophysical processes, functions, structures, and patterns across the landscape. Alternatives 4 and 6 would show the highest upward trends. Alternative 7 would have many upward trends but is also projected to show some downward trends in the reserves and in some unroaded areas. Over time, natural disturbance events such as fire, insects, and disease would tend to be of higher intensity and more unpredictable, especially within reserves.
- Alternatives 1, 2, and 5 are less focused on restoration of ecological processes, functions, structures, and patterns and would have less consistency in managing aquatic/riparian resources. They would also have less emphasis on reducing impacts from roads. Alternatives 1 and 5 would have more management emphasis on production, which can increase risks to aquatic, riparian, and terrestrial resources. Under these alternatives, many subbasins would become ecologically stable over time, but many would also show downward trends.

Managing Multiple Risks and Future Trends

Alternatives 3 through 7 have more emphasis on recognizing these risks than Alternatives 1 and 2. Alternatives 4 and 6 would more actively respond to these multiple risks, especially in placing emphasis on hazard reductions from fire in concert with aesthetics and habitat needs. Alternative 7 would pose greater risks from wildfire, insect, and disease outbreaks in some areas, as natural disturbances may not always be contained within reserves. Alternative 5 places emphasis on these risks, but it would be a more variable response due to different levels of management priority throughout the planning area.

Cost Analysis of the Alternatives

- Based on total annual implementation costs of the alternatives, it appears that Alternatives 3, 4, and 5 present the greatest relative increase in costs compared to Alternatives 1 and 2. Not all activities and costs which may or may not be directly or indirectly affected by the EIS were included in the cost calculation tables. For example, the annual cost estimate for Alternative 2 is substantially less than the total estimated annual budgets for the Forest Service and BLM.
- Some requirements can be considered costs additional to current agency land management. For example, the costs of an Integrated Weed Management strategy for rangelands. Some costs represent no additional cost, rather a re-prioritizing of existing resources to meet the broad scale ecosystem objectives of an alternative.
- The sensitivity analysis estimated the costs and likelihood of funding of activities empahsized in each alternative. For example, an expensive new program would be highly sensitive, while a traditionally funded activity such as timber harvest would be low sensitivity.
- A comparison of alternatives shows that Alternative 1 would have the highest proportion of projected activities which may be least sensitive to funding, with 60 percent of the costs in the "low sensitivity" category for each alternative. At the other end of the spectrum, Alternative 7 would be the most sensitive to funding the "high" or "moderate to high" sensitivity categories. Alternatives 3, 4, and 6 would fall in the middle.

UCRB Chapter 1

Purpose and Need

Contents

Key Terms

Adaptive management ~ A type of natural resource management in which decisions are made as part of an on-going process. Adaptive management involves testing, monitoring, evaluation, and incorporating new knowledge into management approaches based on scientific findings and the needs of society. Results are used to modify management policy.

Biological diversity (biodiversity) ~ The variety and variability among living organisms and the ecological complexes in which they occur.

Ecological integrity ~ In general, ecological integrity refers to the degree to which all ecological components and their interactions are represented and functioning; the quality of being complete; a sense of wholeness. Absolute measures of integrity do not exist. Proxies provide useful measures to estimate the integrity of major ecosystem components (forestland, rangeland, aquatic, and hydrologic). Estimating these integrity components in a relative sense across the basin, aids in explaining current conditions and prioritizing future management. Thus, areas of high integrity would represent areas where ecological function and processes are better represented and functioning than areas rated as low integrity.

Ecological processes ~ The flow and cycling of energy, materials, and organisms in an ecosystem.

Ecosystem-based management ~ Scientifically based land and resource management that integrates ecological capabilities with social values and economic relationships, to produce, restore, or sustain ecosystem integrity and desired conditions, uses, products, values, and services over the long term.

Ecosystem health (forest health, rangeland health, aquatic system health) ~ A condition where the parts and functions of an ecosystem are sustained over time and where the system's capacity for self-repair is maintained, such that goals for uses, values, and services of the ecosystem are met.

INFISH ~ Interim Inland Native Fish Strategy for the Intermountain, Northern, and Pacific Northwest regions (Forest Service).

Issue ~ A matter of controversy, dispute, or general concern over resource management activities or land uses. To be considered a "significant' EIS issue, it must be well defined, relevant to the proposed action, and within the ability of the agency to address through alternative management strategies.

PACFISH ~ Interim strategy for managing Pacific anadromous fish-producing watersheds in eastern Oregon and Washington, Idaho, and portions of California.

Planning area ~ Refers to either the UCRB EIS area or the Eastside EIS area

Project area ~ refers to the entire ICBEMP area, encompassing both EIS areas

Resilience ~ (1) The ability of a system to respond to disturbances. Resiliency is one of the properties that enable the system to persist in many different states or successional stages. (2) In human communities, refers to the ability of a community to respond to externally induced changes such as larger economic forces.

Restoration ~ Holistic actions taken to modify an ecosystem to achieve desired, healthy, and functioning conditions and processes. Generally refers to the process of compensating for disturbances on an ecosystem so that the system can resume acting, or continue to act, as if those disturbances were absent. Ecological restoration includes well-laid plans and is targeted toward a specific historical ecosystem model.

Scoping ~ the early stages of preparation of an environmental impact statement, used to solicit public opinion, receive comments and suggestions, and determine the issues to be considered in the EIS analysis.

Sustainability ~ (1) Meeting the needs of the present without compromising the abilities of future generations to meet their needs; emphasizing and maintaining the underlying ecological processes that ensure long-term productivity of goods, services, and values without impairing productivity of the land. (2) In commodity production, refers to the yield of a natural resource that can be produced continually at a given intensity of management.

Viable population ~ A population that is regarded as having the estimated numbers and distribution of reproductive individuals to ensure that its continued existence is well distributed in the project area.

For additional terms, see Chapter 5, Glossary.

Introduction

The U.S. Department of Agriculture (USDA) Forest Service and the U.S. Department of Interior (USDI) Bureau of Land Management (BLM) propose to develop and implement a scientifically sound ecosystem-based management strategy for lands they administer in the Upper Columbia River Basin (UCRB). This proposal is part of the Interior Columbia Basin Ecosystem Management Project (ICBEMP). The project reexamines management direction for National Forests and BLM-administered lands across parts of seven States and provides a context for managers to make sound, local decisions while considering effects, particularly cumulative effects, at a scale larger than individual administrative units.

Two Environmental Impact Statements (EISs) were prepared to examine management options in different portions of the interior Columbia River Basin. This document, the UCRB Draft EIS, addresses Forest Service- or BLM-administered (agency) lands in parts of Idaho, Montana, Wyoming, Nevada, and Utah (Map 1-1). A separate document, the Eastside Draft EIS, addresses agency lands in eastern Oregon and Washington. Both Draft EISs were prepared concurrently, in a coordinated manner, and have the same seven alternatives. Each EIS reflects differences in conditions and trends that exist in one area but not the other. Neither document proposes or imposes management direction or requirements on any private lands in the project area.

Chapter 1 of this EIS describes the ICBEMP project area, UCRB planning area, proposed action, purpose of and need for action, decisions to be made, and public participation activities, including public issues surrounding the proposal. Chapter 2 describes the existing condition of the area, including trends based on historical and current conditions. In Chapter 3, a variety of alternative ecosystem strategies are developed for Forest Service and BLM lands in the UCRB planning area, incorporating the latest scientific information. The possible environmental, social, and economic consequences of implementing each alternative are evaluated and disclosed in Chapter 4. In Chapter 5 the EIS lists the preparers of this document; the literature cited; glossary terms; and the organizations, agencies, and individuals to whom copies of this Draft were sent.

Geographic Project and Planning Areas

The ICBEMP project area encompasses eastern Oregon and Washington, Idaho, western Montana and Wyoming, and northern Utah and Nevada. This area includes approximately 144 million acres, of which about 75 million are administered by the Forest Service or BLM.

Ecosystem Health

A healthy body works the way it's needed to. It can do the work asked of it. Some people ask their bodies to do logging, some to do ranch work, some to type, play football, dance ballet, or teach. These different kinds of work call for different kinds of strength, endurance, or skill. But they all require similar basic conditions of health, such as functioning lungs, hearts, brains, and other parts working together as integrated systems.

The same is true of ecosystems. They do various kinds of work: convert sunlight into plant and animal tissues, sustain life and its many processes, and provide for products and places for people. A healthy ecosystem is one that can do the work expected of it in terms of environmental, social, and economic goals. In order to do this, ecosystems need to have their parts and systems in working order.

One of the signs of a healthy ecosystem in good working order is its ability to respond to disturbances such as fire, insects, or floods in a dynamic way. The system absorbs and recovers from disturbances without losing its processes or functions, although recovery may take varying amounts of time, or specific conditions may look different afterward. If the ecosystem is healthy, it will continue to produce populations of plants and animals that are diverse and viable, waters that are clear, air that is clean, soils that are fertile. A sign of an unhealthy ecosystem is the presence of disturbances that are too large, intense, or frequent for the system to handle.

"**Project Area**" ~ refers to the whole ICBEMP area, encompassing both EIS planning areas.

"**Planning Area**" ~ refers to either the UCRB EIS area or the Eastside EIS area.

The UCRB EIS planning area covers Federal lands within the upper portions of the Columbia River Basin that are administered by the BLM Idaho, Montana, Wyoming, Utah, and Nevada State offices or by the Forest Service Northern and Intermountain Regions, with the exceptions noted below. The Eastside EIS covers those parts of BLM- or Forest Service-administered lands in the interior Columbia Basin, upper Klamath Basin, and Great Basin that are in Oregon and Washington east of the crest of the Cascade Range. Management strategies are proposed for approximately 30 million acres in the Eastside EIS and approximately 42 million acres in the UCRB EIS. Approximately 3 million acres of the project area were excluded from consideration in the UCRB EIS, as discussed below.

Exception: The Targhee and Bridger-Teton National Forests and portions of the Caribou National Forest that lie within the boundaries of both the UCRB and the Greater Yellowstone Ecosystem are excluded from decisions resulting from this EIS. This exception has been made in order to avoid implementing direction for the National Forests of the Greater Yellowstone Ecosystem on a piecemeal basis. All BLM lands within the boundaries of the UCRB, whether or not they overlap with boundaries of the Greater Yellowstone Ecosystem, are covered by the decisions in the UCRB Records(s) of Decision (Hughes and Bosworth 1995).

Map 1-1 illustrates the Interior Columbia Basin Ecosystem Management Project area and the two EIS planning areas. Map 1-2 illustrates the Upper Columbia River Basin (UCRB) planning area in more detail. Table 1-1 lists the National Forests and BLM Districts that lie wholly or partially within the UCRB planning area.

Proposed Action

The Forest Service and BLM propose to provide a scientifically sound, ecosystem-based management strategy for lands administered by the Forest Service or BLM in the upper Columbia River Basin.

Purpose of and Need for Action

Purpose

The purpose of this action is to create a coordinated approach and to select a management strategy that best achieves a combination of the following:

- Restore and maintain long-term ecosystem health and integrity.
- Support economic and/or social needs of people, cultures, and communities, and provide sustainable and predictable levels of products and services from lands administered by the Forest Service or BLM, including fish, wildlife, and native plant communites.
- Update or amend current Forest Service and BLM management plans with long-term direction primarily at the regional and sub-regional levels.
- Emphasize adaptive management over the long term.
- Provide consistent direction at regional and sub-regional levels that will assist managers in making project decisions at a local level in the context of broader ecological considerations.
- Help restore and maintain habitats and viability of plant and animal species, especially for threatened, endangered, and candidate species and of special interest to tribes. This would be done primarily by moving toward desired ranges of landscape conditions on a sub-regional and regional basis.

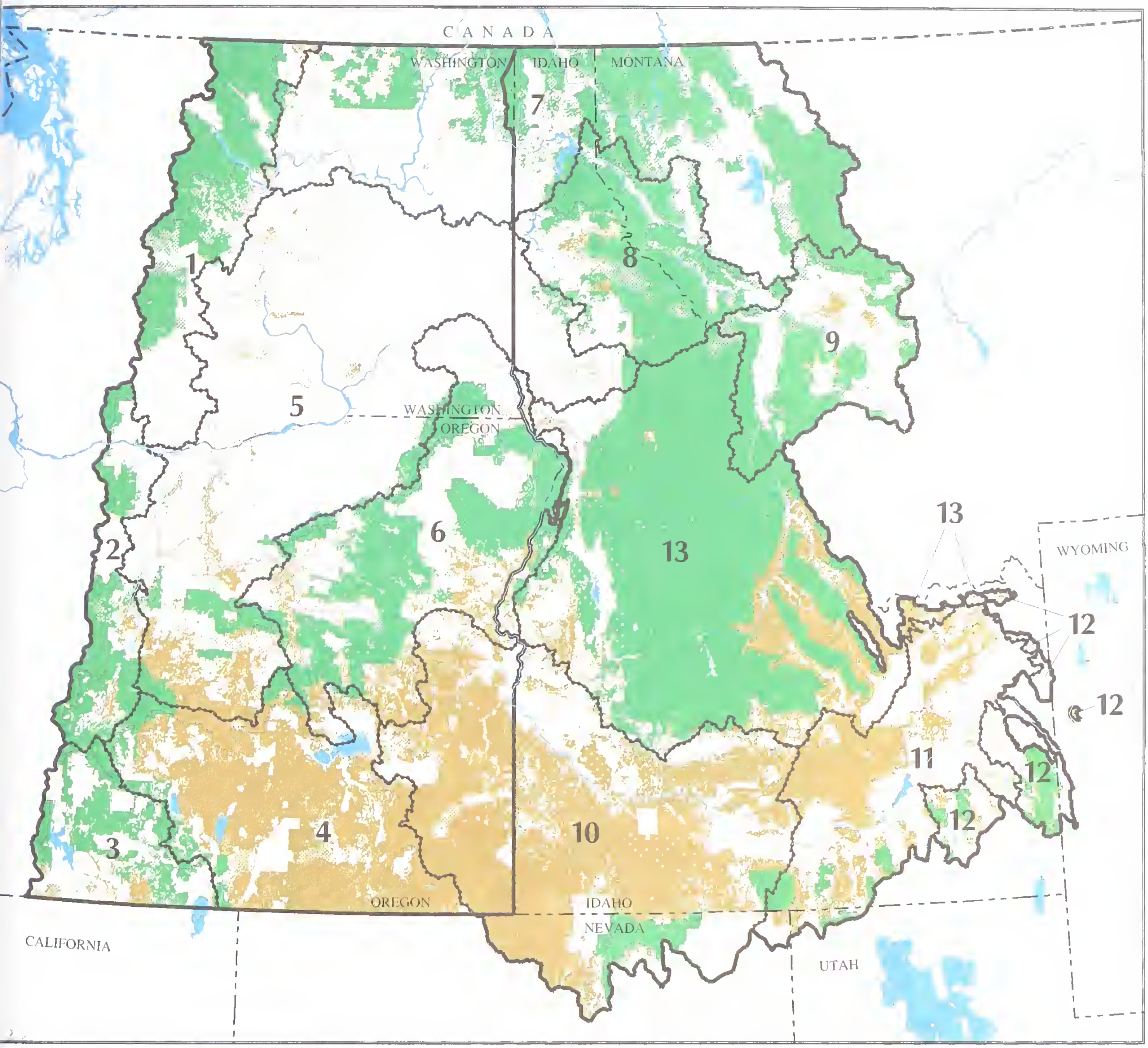
Levels

In this document, the terms regional, sub-regional, and local are used as relative terms that refer to geographic extent. While the specific extent of a region, sub-region, or local area depends on the issue being addressed, the terms generally are used in the following way:

Regional ~ refers to the planning area (one EIS) or the project area (whole ICBEMP)

Sub-regional ~ refers to areas geographically smaller than "regional" but larger than a single administrative unit (such as a National Forest or a BLM District)

Local ~ refers to areas geographically equal to or smaller than a single administrative unit.



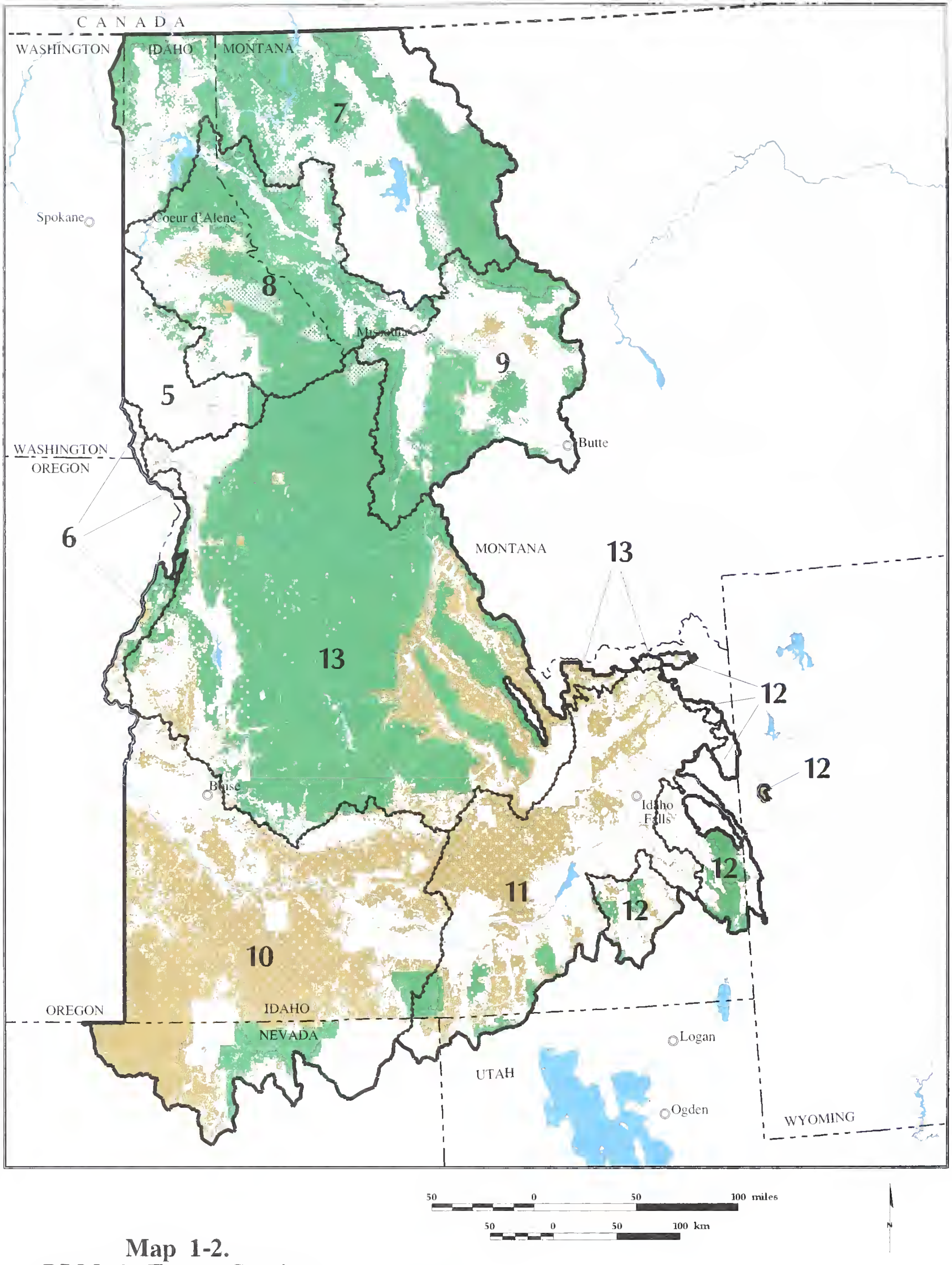
Map 1-1.
BLM & Forest Service Administered Lands

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Project Area
1996

Forest Service Administered Lands
BLM Administered Lands
Water
EIS Area Border
Ecological Reporting Unit Border:

1. Northern Cascades
2. Southern Cascades
3. Upper Klamath
4. Northern Great Basin
5. Columbia Plateau
6. Blue Mountains
7. Northern Glaciated Mountains
8. Lower Clark Fork
9. Upper Clark Fork
10. Owyhee Uplands
11. Upper Snake
12. Snake Headwaters
13. Central Idaho Mountains



Map 1-2. BLM & Forest Service Administered Lands

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Draft UCRB EIS
1996

Forest Service Administered Lands
BLM Administered Lands
Water
EIS Area Border
Ecological Reporting Unit Border:

5 Columbia Plateau
6 Blue Mountains
7 Northern Glaciated Mountains
8 Lower Clark Fork
9 Upper Clark Fork
10 Owyhee Uplands
11 Upper Snake
12 Snake Headwaters
13 Central Idaho Mountains

Table 1-1. National Forests and BLM Districts Addressed by the UCRB EIS.

State	National Forest Or Blm District	Unit Size (Approx. Acres in the UCRB)
Idaho	Bitterroot NF	470,500
	Boise NF	2,573,500
	Caribou NF (*excludes portion within the GYE)	580,000
	Challis NF	2,463,000
	Clearwater NF	1,814,500
	Curlew NG	4,000
	Idaho Panhandle NF (*includes WA 119,000 ac)	2,456,000
	Kootenai NF	45,000
	Nez Perce NF (*includes portion assigned to EEIS)	2,111,500
	Payette NF (*includes portion assigned to EEIS)	2,354,000
	Salmon NF	1,687,500
	Sawtooth NF	1,691,000
	Lower Snake River District (BLM)	5,169,000
	Upper Snake River Districts (BLM)	5,017,000
	Upper Columbia-Salmon Clearwater Districts (BLM)	1,550,500
Montana	Bitterroot NF	1,115,000
	Deerlodge NF	695,000
	Flathead NF	2,369,500
	Helena NF	385,000
	Idaho Panhandle NFs	27,500
	Kootenai NF	2,207,000
	Lolo NF	2,075,000
	Butte District (BLM)	150,000
Nevada	Humboldt NF	632,000
	Elko District & Winnemucca District (BLM)	1,953,000
	Lower Snake River District (BLM)	49,500
Utah	Sawtooth NF	59,000
	Salt Lake District (BLM)	52,500
Wyoming	Caribou NF	7,000
	Rock Springs District (BLM)	23,000
TOTAL	**Forest Service and BLM**	**41,787,000**

SOURCE: ICBEMP GIS data (converted to 100x100 meter grid and rounded to nearest 500 acres). These totals will not match official Goverment Land Office (GLO) totals or those shown elsewhere in documents that were calculated from a 1000x1000 meter grid (1 km^2).

- Provide opportunities for cultural, recreational, and aesthetic experiences.
- Replace interim direction (PACFISH and INFISH) with primarily ecosystem-based, long-term, regional and sub-regional strategies, to provide a broader context for local direction.
- Identify where current policy, regulation, or law may act as barriers to implementing the strategy or achieving desired conditions.

Need

The alternative management strategies examined in detail in this EIS are based upon underlying needs for:

- **Restoration and maintenance of long-term ecosystem health and integrity.** There is a need to restore and maintain forest, rangeland, and aquatic and riparian ecosystem health and integrity and to identify desired ranges of future landscape conditions for vegetation structure, composition, succession, and disturbances; for hydrologic processes and functions; and for aquatic habitat structure and complexity.
- **Support of the economic and/or social needs of people, cultures, and communities, and sustainable and predictable levels of goods and services from National Forest System and Bureau of Land Management lands.** There is a need to contribute to the vitality and resiliency of human communities and to provide for human uses and values of natural resources consistent with maintaining healthy, diverse ecosystems.

Identification of these needs comes primarily from:

- Changed conditions;
- New information and understandings of ecological relationships; and
- Requirements and authority for more comprehensive regional and sub-regional long-term management direction.

These conditions, information, and requirements have developed or become more apparent since current land-use plans were signed.

Changed Conditions

Since most current plans have been in effect, ecological and social-economic conditions have changed, as documented in *An Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins* (Quigley and Arbelbide 1996), the *Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia Basin and Portions of the Klamath and Great Basins* (Quigley, Graham, and Haynes 1996), and other studies. Society places value on many of the changes that have occurred on Federal lands since historical times (around the mid-1800s), while other changes may cause concern. Many pre-settlement conditions are neither reasonable nor possible to recreate because of such factors as dams, urban development, highways, and land-use or ownership patterns. Historical conditions are described not as a goal but as a reference to help understand landscape potential, how landscapes evolve, the role of disturbance on the landscape, and human influences on landscapes.

Forest ecosystem health has been deteriorating in some places, as evidenced by increasing occurrences of uncharacteristic insect and disease outbreaks and intense wildfires. Declines in rangeland health are evidenced by the spread of exotic plants and changes in fire frequency. The social and economic stability of some communities dependent on National Forest System and BLM-administered lands has been placed at increasing risk, as evidenced by declining predictability in some resource supplies related to declining ecosystem health and to administrative appeals and lawsuits over broad-scale issues such as water quality, species viability, and cumulative effects. Aquatic and riparian ecosystem health also has declined, as evidenced by a lack of habitat complexity, loss of connectivity, and altered hydrologic functions in many areas. Concern about the future of threatened, endangered, and sensitive species has been increasing, as evidenced by additional listings under the Endangered Species Act (ESA) and proposals for such listings.

Specific observations and symptoms that support the need to respond to changed conditions and understandings of land and resources include, but are not limited to, the following trends, which are derived from the *Assessment* (Quigley and Arbelbide 1996) and are described in detail in Chapter 2.

- Current conditions in **forested** communities indicate significant changes in the successional and disturbance processes since European settlement in the basin in the 1800s. Traditional forestry emphasized harvest of the largest

trees, including removal of shade-intolerant species (such as ponderosa pine) that are resistant to fires and droughts and that in open stands are resistant to insects and diseases. As an example, fire prevention and suppression changed dry forests with large, fire-tolerant species and minimal fuel loads to forests comprised of few large trees; many small patches of dense, small- and medium-sized shade-tolerant trees; and heavy fuel loads. These areas are more susceptible to fires, insect outbreaks, and disease epidemics. Fire regime patterns on the landscape have been converted from low-intensity ground fires that burned in a mosaic and maintained the vegetation pattern and structure, to homogeneous high-intensity crown fires that replace the vegetation structure. These changes have decreased productivity, increased the probability of severe or chaotic events, and resulted in habitats that differ from those with which native wildlife species evolved.

◆ Current trends in **rangeland** plant communities indicate that substantial changes have occurred in structure and species composition. Shrub canopies are becoming more dense, with an accompanying decline in perennial grasses and forbs. Current conditions in many shrublands are characterized by a changed vegetation structure that is more susceptible to uncharacteristic fire regimes. In both shrub and grassland communities, these changes in vegetation and changes in soil integrity and productivity have inhibited plant communities' abilities to compete with invading exotic plants, which replace native species with uniform communities of weedy species. The loss of native plant species results in a loss of resiliency and productivity of forage and browse for wildlife species and domestic livestock and loss of habitat structure that supports native wildlife. The physical structure of rangeland soils has been sufficiently altered over many decades in some areas to the point where soil functions have been impaired.

◆ Increasing risks to **species population viability, species diversity, and species abundance** of some plants and animals are attributed to loss of diverse aquatic and terrestrial habitats that are well distributed and well connected across the landscape. These increasing risks are evidenced by additional listings under the Endangered Species Act, proposals for such listings, and successful lawsuits over compliance with viability requirements of the National Forest Management Act (NFMA). Approximately 34 species of plants, terrestrial vertebrates, and fish in the ICBEMP project area have Federal listing status of either endangered, threatened, proposed, or candidate.

◆ In some **aquatic and riparian environments**, hydrologic functions have been altered. Water quality, amount and timing of streamflow, natural sediment levels, streambank stability, and the amount and distribution of woody debris are among the features that have been altered. Complexity has decreased and connectivity has been lost between streams, their floodplains, adjacent riparian areas, and uplands. These changes have contributed to decreases in the natural reproduction of anadromous and inland fishes and other aquatic-dependent species. Native species no longer inhabit important portions of their historical ranges. Numbers of many remaining populations have decreased or are isolated. Important strongholds for salmonids and regions of high ecological integrity are scattered throughout the basin and generally are tied to lands under Federal management.

◆ **Human uses and values** have undergone rapid change along with changing biophysical conditions over the past 50 years, confronting managers and the public with a complex situation for which no easy answers exist. Based on society's needs and values, choices were made to promote development, grow crops, raise cattle, build dams, build roads, and harvest timber among other activities. The area's population has increased significantly during this period, which has increased pressure on natural resources, and it appears this trend will continue. More recently, values have shifted among some of the American public toward a stronger emphasis on environmental quality and resource protection, intensifying controversy about the role of resource use on public lands. A declining and unpredictable flow of commodities from public lands has directly affected local people in resource-dependent communities through job losses, and has generated national and regional consequences as well. Declining ecosystem health conditions generally have increased the risk of large-scale losses or damages to property. Changes within the forests and rangelands have affected use patterns of certain wildlife species with consequences for adjacent lands.

◆ American Indians were primary users of public lands historically. **Tribal rights and interests**

in public lands and resources persists today; however, traditional use patterns have changed. Examples include the following: changes in access; the presence and availability of resources that the tribes reserved the right to use; and competition with non-Indians over resource use.

- The increasing number of **appeals and lawsuits** over Forest Service and BLM land management decisions suggests changing attitudes, beliefs, and values regarding healthy, productive, and well balanced resource conditions. Some appeals and lawsuits have focused on such regional issues as species viability, biodiversity, and related cumulative effects, which have been difficult to address successfully because of the absence of a truly broad scale dimension to BLM and Forest Service land management planning.

New Information and Understandings

Increased scientific understanding of ecosystem processes and functions over the past decade has led to better awareness that many forest, rangeland, riparian, and aquatic ecosystems are becoming less resilient, as discussed above. Cumulative human activities and management practices – such as timber harvest, fire exclusion, pest suppression, livestock use, road construction, mining and waste disposal, flood control and irrigation, agricultural development, fish harvest and hatcheries, increased recreation use, and urban expansion – are now known to have affected natural resource conditions in ways that were previously not understood. While these conditions have evolved over many decades as a result of the interaction of human activity and naturally occurring events, new knowledge and understanding of their implications for long-term ecosystem health are only now coming to light.

Requirements or Authority for New Long-Term Management Direction

Requirements or authority for permanent, ecosystem-based, management direction have come from: directives; commitments made through interim direction; consultations with regulatory agencies; and court orders including *Pacific Rivers Council v. Thomas*. (See Appendix B for more details.) These include but are not limited to the following:

- Directives

  Chief of the Forest Service's directive of June 4, 1992, directing Regional Foresters and Station Directors to undertake ecosystem-based management on National Forests and Grasslands.

  Director of BLM's memo of August 20, 1993, directing all employees to undertake an ecosystem-based approach to land management.

  President Clinton's directive of July 1993, directing the Forest Service to develop a scientifically sound and ecosystem-based strategy for management of eastside forests.

  BLM's directive of late 1993 to develop a similar strategy for eastside BLM-administered lands. These led to directives in the project's Charter.

  Chief of the Forest Service's decision of 1994 related to the Forest Service's Western Forest Health Initiative.

  Chief of the Forest Service's October 1994 Forest Service Ethics and Course to the Future.

- Commitments Made Through Interim Direction

  PACFISH-Implementation of Interim Strategies for Anadromous Fish-Producing Watersheds in Eastern Oregon, Washington, Idaho, and Portions of California (Feb. 24, 1995): Calls for long-term strategy to be developed and evaluated for arresting the degradation and beginning the restoration of aquatic and riparian ecosystems for anadromous fish.

  INFISH-Inland Native Fish Strategy (July 28, 1995): Calls for long-term management direction to protect habitat and populations of resident native fishes outside of anadromous fish habitat.

- Consultations with Regulatory Agencies

  Each of the alternatives analyzed in this Draft EIS is a programmatic approach to management of Forest Service- and BLM-administered lands within the project area. This Draft EIS does not analyze on-the-ground impacts of site-specific management actions. On-the-ground impacts will be assessed in subsequent decision-making before site-specific actions will be taken.

  Formal consultation under Section 7 of the Endangered Species Act with U.S. Fish and Wildlife Service and National Marine Fisheries Service will be completed before any decisions are made on the basis of this EIS. Formal

consultation will include the preparation of a Biological Opinion, which will not address incidental take of listed species because of the programmatic nature of the alternatives analyzed in this EIS. Assessment of the incidental take can only be accomplished for site-specific actions.

Subsequent proposals for site-specific actions that implement the programmatic approach to management selected from this EIS, and which "may affect" a listed species, shall require consultation with the National Marine Fisheries Services and the U.S. Fish and Wildlife Service. Those site-specific consultations will assess on-the-ground impacts and will include specific incidental take statements in the Biological Opinion. The National Marine Fisheries Service and the U.S. Fish and Wildlife Service will continue to coordinate with the Forest Service and BLM regarding implementation of the programmatic approach to management selected from this EIS.

Management Priorities

In developing and implementing decisions, the Forest Service and BLM are guided by some basic principles and priorities. Both the Forest Service and the BLM are multiple-use agencies that promote the sustainability of ecosystems by ensuring their health, diversity, and productivity. Priorities for management will include:

- **Protecting Ecosystems**. The agencies will work to ensure the health and diversity of ecosystems while meeting people's needs. Special care for fragile or rare ecosystem components will be provided on lands administered by the Forest Service or BLM.
- **Restoring Deteriorated Ecosystems**. The BLM and Forest Service will improve deteriorated ecosystems on the lands they administer, based on scientific understanding and emerging technologies.
- **Providing Multiple Benefits for People Within the Capabilities of Ecosystems.** Within the limitations of ecological integrity, health, and diversity, forests and rangelands must meet people's needs for uses, values, products, and services.

Decisions resulting from this EIS and subsequent actions will be implemented under these three priorities. In essence, ecosystems must be healthy, diverse, and productive in order to meet the needs of society today as well as those needs of future generations.

New Information

New information that documents the observations and symptoms described above includes recent research, studies, and reports on ecosystem functions and processes, conservation biology, ecosystem health, species viability, and plan implementation. Some of the major studies are listed below and are discussed in Appendix A. For a complete list of literature cited in this EIS, see Chapter 5.

- *An Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins.* (Quigley and Arbelbide 1996)
- *An Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia Basin and Portions of the Klamath and Great Basins.* (Quigley, Graham, and Haynes 1996)
- *Assessing Forest Ecosystem Health in the Inland West.* (Sampson and Adams 1994)
- *Distribution of Two Exotic Grasses on Intermountain Rangelands: Status in 1992.* (Pellant and Hall 1994)
- *Eastside Forest Ecosystem Health Assessment.* (Everett et al. 1994)
- *Environmental Assessment for the Implementation of Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH).* (USDA Forest Service and USDI Bureau of Land Management 1994)
- *Inland Native Fish Strategy Environmental Assessment Decision Notice and Finding of No Significant Impact: Interim Strategies for Managing Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, Western Montana and Portions of Nevada (INFISH).* (USDA Forest Service 1995)
- *Eastside Forests Scientific Panel Report to Congress and President on Interim Protection for Late-successional Forests, Fisheries, and Watersheds for National Forests East of the Cascade Crest in Oregon and Washington.* (Henjum et al. 1994)
- *Management History of Eastside Ecosystems: Changes in Fish Habitat over 50 Years, 1935-1992.* (McIntosh et al. 1993)
- *Pacific Salmon at the Crossroads: Stocks at Risk from California, Oregon, Idaho, and Washington.* (Nehlsen et al. 1991)

Background

In the western portion of the Pacific Northwest, a long-lasting controversy concerning management of old-growth ecosystems and associated species on Federal lands resulted in numerous lawsuits, court rulings, appeals, and protests. The Northwest Forest Plan was completed to address those issues. In recent years, the controversy has expanded to the rest of the Pacific Northwest over management of old forest ecosystems, anadromous fish species, and other resources on Federal lands. The traditional approach of individual BLM and Forest Service offices addressing single resource issues has sometimes resulted in conflicting management direction among agencies and offices, as well as management of competing resource needs. Interim strategies including PACFISH and the Inland Native Fish Strategy (INFISH) were put in place as temporary measures until permanent direction could be prepared.

In July 1993, as part of his plan for ecosystem-based management in the Pacific Northwest, President Clinton directed the Forest Service "to develop a scientifically sound and ecosystem-based strategy for management of eastside forests," referring to National Forest System lands in eastern Oregon and Washington east of the Cascade Crest. The BLM joined the effort in late 1993. In July 1994 the Director of the BLM and the Chief of the Forest Service directed that a separate EIS team develop an ecosystem-based management strategy for forests and rangelands administered by the Forest Service or BLM in the upper Columbia River Basin (UCRB).

To provide the appropriate context for development and implementation of an ecosystem-based management strategy, the Chief of the Forest Service and the Director of the BLM chartered an interagency team of Federal scientists, referred to as the Science Integration Team (SIT). The SIT was directed to: examine ecological, economic, and social systems; look at current as well as historical conditions; and see whether outcomes associated with current practices and trends would be consistent with long-term maintenance of ecosystem processes.

Products developed by the SIT are discussed in more detail in Appendix A. They include the following documents:

- *A Scientific Framework* of broad concepts and analytical processes for ecosystem analysis, planning, management, and monitoring at various scales on lands administered by the Forest Service or BLM in the interior Columbia River Basin;
- *A Scientific Assessment* of ecosystem processes and functions within the interior Columbia River Basin, which resulted in two documents (*An Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins*, and *An Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia Basin and Portions of the Klamath and Great Basins*) that provided the basis for developing both EISs; and
- An evaluation of the ecosystem-based management alternatives developed in the Draft Eastside and UCRB EISs.

As directed by the project charter, both the Eastside and UCRB strategies:

- Focus on restoring the health of forest, range, aquatic, and riparian ecosystems;
- Draw from the recently completed forest health studies (Everett et al. 1994, Sampson and Adams 1994) and other studies, including the *Scientific Assessment* and other Science Integration Team products (see Appendix A);
- Are scientifically sound and ecosystem-based;
- Recognize the integration of human elements with biophysical systems;
- Involve the public in an open multi-agency process; and
- Are analyzed through an environmental impact statement.

As directed, the two EIS teams collaborated with each other, the SIT, and the public. These efforts were conducted in compliance with the National Environmental Policy Act (NEPA) and with BLM and Forest Service planning regulations. Also participating in the EIS process were the U.S. Fish and Wildlife Service, National Marine Fisheries Service, Environmental Protection Agency, U.S. Geological Survey, U.S. Bureau of Mines, National Park Service, Bureau of Indian Affairs, and Natural Resources Conservation Service (formerly Soil Conservation Service). Coordination with tribal, Federal, State, county, and local government agencies occurred throughout the process.

Decisions to Be Made

Planning Considerations

The Nature of Planning on National Forest System and BLM Lands

In order to understand the decisions to be made based on this EIS, it is important to understand the Forest Service's and BLM's multi-stage process for land-use planning.

Under the Forest and Rangeland Renewable Resources Planning Act of 1974, the Forest Service Chief's office prepares nation-wide Renewable Resources Assessment and Program documents (36 CFR 219.4(b)). Under the Federal Land Policy and Management Act of 1976, the BLM Director provides guidance for the preparation of resource management plans, which includes national level policy (43 CFR 1610.1(a)).

The next planning level involves preparation of a regional guide for each Forest Service region to address "major issues and management concerns which need to be considered at the regional level" (36 CFR 219.8(a)). Parallel to this, the BLM State Director provides State level guidance for resource management plan preparation (43 CFR 1610.1(a)). Next, individual National Forest and BLM land-use plans are prepared, which are "land and resource management plans (*forest plans*) for units of the National Forest System" (16 U.S.C. 1604(a); 36 CFR 219.10 to 219.27) and "resource management plans [which are] prepared and maintained on a resource area basis" (43 CFR 1610.1(b)).

Finally, individual projects, such as timber sales, are evaluated and may be approved only if they are consistent with applicable Forest Service or BLM land-use plans and other applicable environmental standards (16 U.S.C. 1604(I), 36 CFR 223.30, and 43 CFR 1610.5-3).

Plans for both National Forest System and BLM-administered lands are designed to be consistent with national-level agency policies and regulations. BLM plans at the project or activity level tier to resource management plans or management framework plans, which may be based on State Director guidance when needed. Forest Service project plans must be consistent with forest plans, which in turn are based on regional guides. When needed, larger scale multi-regional plans, such as this one, may be developed for issues that cross jurisdictional boundaries. Forest health and anadromous fish species viability are two such issues.

When a large-scale plan is prepared for management of federal lands on a regional or multi-regional basis, a broad overview EIS, or *programmatic* EIS, can provide a valuable and necessary analysis of the affected environment and potential cumulative effects of the reasonably foreseeable actions under that program or within that geographical area. One or more analyses of lesser scope or a site-specific EIS or analysis can be tiered to a programmatic EIS.

To comply with statutory obligations arising from the National Forest Management Act, Federal Land Policy and Management Act, National

The Role of Science in Ecosystem-based Management

"Scientific research has a significant role in ecosystem management, including the use of scientific methods in understanding the basic capabilities of different ecosystems, discerning the needs and wants of people, ... and designing monitoring systems to allow for periodic adaptation to new knowledge. However, there are not unique or scientifically perfect answers for how a balance of goals and practices for ecosystem management should be struck. People's values, preferences, and aspirations are crucial factors in policy making.

The role of science in ecosystem management is to help define what is possible ... to shed light on how to best attain a desired set of conditions or benefits, and to help people understand the estimated costs, benefits, and consequences of alternative courses. To fulfill this role effectively, social, biological, and physical sciences must be integrated to reflect the complexity of how ecosystems actually function."

– H.Salwasser, Regional Forester, USDA Forest Service Region 1
excerpted from Salwasser 1994

Environmental Policy Act, Endangered Species Act, Clean Water Act, and other environmental laws, it is necessary to perform site-specific environmental analysis of projects and activities prior to making an irreversible or irretrievable commitment of resources. It is virtually impossible to prepare a Forest Service or BLM land-use plan and associated EIS of sufficient specificity to identify and adequately analyze all projects or activities that may occur in the 10-year planning period.

Courts have recognized the difference in the nature of environmental impacts caused by such programmatic decisions, and the NEPA obligations are more limited. One court characterized forest plans in the following way. (This characterization is applicable to BLM resource management plans, as well.)

> [A forest plan] is, in essence, a programmatic statement of intent that establishes basic guidelines and sets forth the planning element that will be employed by the Forest Service in future site-specific decisions.
>
> It provides guidelines and approved methods by which forest management decisions are to be made for a period of 10 to15 years. Adoption of the plan does not effectuate any on-the-ground environmental changes. Nor does it dictate that any particular site-specific action causing environmental injury must occur. *Sierra Club v. Robertson*, 28 F.3d 753 (8th Cir. 1994)

Thus, regional guides and Forest Service or BLM land-use plans are only part of a multiple-level decision making framework. It is the subsequent site-specific level of decision making that affects the environmental status-quo. Site-specific decisions are made by local managers (Forest Supervisors, District Managers, District Rangers, Area Managers). These officials and their staffs are familiar with the issues presented and local conditions associated with the planning area and are charged with monitoring and evaluating the land-use plan or resource area and proposing changes to it, as necessary, through amendment and revision.

Status of Planning on National Forest System and BLM Lands

During the late 1970s, 1980s, and early 1990s, the BLM and Forest Service released comprehensive land-use plans and framework documents for individual National Forests and Grasslands and BLM Districts. Appendix A includes a list showing the current plans in the UCRB area and their approval dates. These plans remain in effect until amended or revised. The Forest Service is required by NFMA to revise forest plans at least every 10 to 15 years. BLM plans are generally revised every 10 to 15 years. Several plans are currently being revised and their efforts are being coordinated with this project.

Decisions made by the Forest Service and BLM based on the UCRB EIS are expected to amend existing land-use plans and may amend regional guides, where they conflict with the new decisions. The relevant parts of the selected alternative will become part of these plans and will guide project decision-making until replaced through subsequent amendment or revision.

For the purpose of the analysis and disclosure of environmental impacts, direction from the Record of Decision (ROD) for the UCRB EIS is assumed to be in place for 10 years. Direction that is specific to each individual administrative unit (sueh as standards applicable to particular areas) will be revisited at the time of revision. Direction that applies to multiple units (such as broad-scale objectives) will remain in place to guide future amendments and revisions. It is the intent of the agencies that subsequent plan amendments or revisions for individual administrative units will be designed to achieve this broad-scale direction.

Implications of Planning for Multiple Administrative Units

The process for making programmatic decisions is described in Forest Service regulations at 36 CFR Part 219, and in BLM regulations at 43 CFR Part 1600. These processes were designed to facilitate planning for individual administrative units, and to address issues specific to those units. This EIS and resulting decision will focus on large-scale issues that cross jurisdictional boundaries. This focus provides a broad context for management strategies that cannot adequately be developed at the BLM and Forest Service land and resource management plan level. The purpose and need for the proposed action is much broader than a traditional Forest Service or BLM land-use plan and EIS and is based on a different management approach, ecosystem-based management. Because of this broader focus, the Forest Service and BLM planning regulations do not precisely fit the type of land-use plan amendments that will occur if one of the action alternatives should be selected.

Much of the management direction proposed for adoption is applicable to multiple administrative units in aggregate rather than to individual units. As such, it is not possible to reliably predict actions or effects for each unit. Moreover, determinations with respect to each administrative unit that would normally be made as part of the planning process are not possible. As with many planning concepts developed in the late 1970s and early 1980s, the regulations must be applied to the extent reasonable, given the current broader focus on ecosystem-based management and interagency cooperation as depicted in this EIS.

This Assessment and EIS Process

What Has Been Accomplished to Date

The Science Integration Team (SIT) prepared the *Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins* (Quigley and Arbelbide 1996) and several smaller documents, as well as databases and computer models. The databases contain information on vegetation, landform, climate, stream inventories, terrestrial species relationships, county indicators, and economic conditions. The models range from those that predict change in vegetation under different disturbance regimes to those that describe resiliency of people's communities. Together, the documents, databases, and models provide the basis for an assessment of the project area.

Database/information systems/information gathering for the ICBEMP generally can be categorized into five groups: 1) databases (more than 20 were acquired or developed); 2) GIS themes or layers (more than 170 were generated); 3) expert panels/workshops (approximately 40 were convened); 4) contract reports (more than 130 were used); and 5) current literature reviews.

From an ecological perspective, the *Assessment* developed an understanding of the status, condition, and trends associated with the components of the ecosystems and economies of the project area. The SIT characterized the landscape and vegetation components from a broad perspective, addressing those elements that have been altered during the past 100 years and developing the concept of the biophysical template that brings understanding to the capabilities and disturbance processes operating in the environment. Terrestrial wildlife species and their habitats within the project area were characterized and examined from a broad perspective, bringing forward a reduced list of species that are likely to be at risk. The SIT also characterized and examined aquatic species and their habitats within the project area, drawing from information about species abundance, distribution, diversity, and habitat inferences.

Projections of risk came primarily from a functional perspective, identifying those elements that affect the aquatic, terrestrial, and landscape systems using common databases and assumptions about the future. These findings and projections are useful considerations for managers as they examine future options and establish policies regarding management.

What is Yet to be Accomplished

Because the ICBEMP represents a new way of thinking, as of the publication of this Draft EIS many items were left undone from an ecological perspective. These are items that will be completed before publication of the Final EIS(s).

The level of understanding brought forward together with the models, databases, and GIS themes now make possible a process of prioritization and integrated risk assessment that was not possible until now. The team is ready to prioritize the most important habitat for aquatic species persistence. With that identification, the question could be answered of what disturbance processes are likely to affect these areas and which of these will likely have the greatest negative impact on the aquatic system. The result would be an integrated risk statement concerning aquatic systems related to broad-scale disturbance processes.

The information is now available to initiate the process of grouping terrestrial wildlife species into similar communities of species, identifying the most important habitats for terrestrial species persistence, and identifying disturbances that cause the greatest risk to their continued persistence. This information makes it possible to answer the integrated risk questions associated with terrestrial species and their habitats related to broad-scale disturbance processes. This should also make it possible to address the questions of connectivity and fragmentation regarding the important habitat features of terrestrial species guilds. Addressing the integrated

risk questions from a landscape perspective allows the integration of aquatic strategies with terrestrial species and an evaluation of the risks associated with broad-scale disturbances and broad management direction/activities.

New Information and the Adaptability of Plans

The *Scientific Assessment* and UCRB and Eastside EISs may provide significant new information within the meaning of the Council of Environmental Quality regulations and the BLM and Forest Service planning regulations. This may require supplementation of NEPA documents, amendment or revision of plans, or reinitiation of consultation under the Endangered Species Act.

Adjustments in plan direction are crucial to the agencies' ability to meet the continuing compliance and new information obligations of NEPA and other environmental laws.

Each new piece of information will raise new questions as it answers others. Recognizing this is a key feature of adaptive management. Continually assessing resources from a broad perspective as well as from finer scales will enable managers to address the full complement of risk.

The alternatives brought forward in this Draft EIS open the door to new understanding that will grow and advance as the next several years progress. It can be thought of as a continuum of information and advances of knowledge. Adaptive management processes will be important at the project area level, as well as at lower levels. The selected alternative would attempt to fully manage the risks to important ecological and economic resources if the ability to assess broad scale conditions and risks are coupled with adaptive processes on administrative units.

Decisions That Will Be Made Through This Planning Process

For the UCRB EIS, responsible officials for National Forest System lands in the planning area are the Regional Foresters for the Intermountain Region and the Northern Region. Responsible officials for the UCRB public lands administered by the BLM are the State Directors for the States of Idaho, Montana, Wyoming, Utah, and Nevada.

Once the Final EIS has been completed, the responsible officials can decide to:

- Select one of the alternatives analyzed within the Final EIS, including the no-action alternative; or
- Modify an alternative (for example, combine parts of different alternatives), as long as the environmental consequences of the modified action have been analyzed within the Final EIS.

The alternative selected for implementation will be documented in the Record of Decision (ROD).

Specific decisions involved in the selection of an alternative include adoption of:

- Management goals;
- A desired range of future conditions expected over the next 50 to 100 years;
- Objectives to be used in measuring progress toward attainment of the management goals; and
- Standards, which are required actions to be used in designing and implementing future management actions.

A list of guidelines, which are suggested techniques that should prove useful in meeting the objectives, are included in Appendix H. In addition, each alternative specifies a range of management actions (for example, acres of rangeland improvement) needed to achieve the desired range of future conditions. Selection of an alternative does not mandate a specific level of activity. However, the identified range of management actions for the selected alternative will be used in developing future annual work plans and for monitoring the implementation of the ecosystem-based management strategy.

Decision(s) made by the agencies will provide an ecological context for Forest Service and BLM land and resource management plans. They also will help clarify the relationship of agency activities to ecosystem capabilities and will help develop realistic expectations for the production of economic and social benefits. Most decisions will focus on regional and sub-regional problems and establish desired landscape patterns, structure, and succession and disturbance regimes to address the problems. The decision(s) also will

establish general direction for management of habitat for threatened, endangered, and candidate species or communities of species that require integrated management across broad landscapes to assure viability. For the most part, local-level decisions will be deferred to individual administrative units after appropriate site-specific analysis.

The ROD(s) issued by the agencies may amend current Forest Service regional guides, may change planning schedules and funding priorities, and are expected to amend Forest Service and BLM land-use plans if necessary. The ROD(s) will identify necessary changes to policy or suggest modifications to existing laws as needed to implement the decision. The relevant parts of the UCRB EIS's selected alternative will become part of the amended plans and will guide activity-level decision-making until replaced through subsequent amendment or revision. Management direction and land allocations in existing plans not directly superseded by the UCRB ROD(s) will remain in effect.

The alternatives analyzed in the Draft EIS include standards for rangeland health and guidelines for livestock grazing which are consistent with the BLM's grazing regulations (43 CFR 4100). Final standards for rangeland health and guidelines for livestock grazing are also being developed by the Healthy Rangelands initiative, a nationwide effort focusing on rangelands managed by BLM. BLM State Directors are developing these standards and guidelines in consultation with affected Resource Advisory Councils, Provincial Advisory Committees, and others. These standards and guidelines are expected to be finalized in a separate document in August 1997. Objectives, standards, and guidelines being analyzed in this EIS affecting rangeland health and livestock grazing are compatible with BLM's Healthy Rangeland initiative.

Fundamentals of Rangeland Health were established for the BLM in their new regulations signed February 22, 1995 (43 CFR 4180). These fundamentals, described in the following paragraph, are to be used to develop standards for rangeland health and guidelines for livestock grazing on BLM-administered land.

Watersheds are in or are making significant progress toward properly functioning condition, including uplands, riparian areas and wetlands, and aquatic components; soil and plant conditions support infiltration, soil moisture storage, and the release of water that are in balance with climate and landform; and maintain or improve water quality, quantity, and the timing and duration of flow. Ecological processes, including the hydrologic cycle, nutrient cycle, and energy flow, are maintained, or there is significant progress toward their attainment to support healthy biotic populations and communities. Water quantity complies with state water quality standards and achieves, or is making significant progress toward achieving, established BLM management objectives, such as meeting wildlife habitat requirements. Habitats are or are making significant progress toward being restored or maintained for federal threatened, endangered, candidate, or other special status species.

At a minimum, State or regional standards, developed under the fundamentals of rangeland health, must address the following: watershed function; nutrient cycling and energy flow; water quality; habitat for threatened, endangered, proposed, candidate, and special status species; and habitat quality for native plant and animal populations and communities.

The UCRB decision(s) would provide direction only for public lands administered by the Forest Service or the BLM in the planning area. The ROD(s) based on this EIS would make no management decisions for and would not impose regulations on State, local (city or county), tribal, or private lands in the upper Columbia River Basin. The decisions are not intended to affect rights, privileges, regulations, policies, or provisions made by State or local agencies or private landowners.

The combination of goals, objectives, and standards for each action alternative (Alternatives 3 through 7) provide different ecosystem-based management strategies for Forest Service- and BLM-administered lands. Each strategy is intended to replace interim direction from PACFISH and INFISH. This would include direction for both terrestrial and aquatic ecosystems.

Factors Affecting Implementation

Many factors affect implementation of the decisions made through this planning process. Some of these factors affecting implementation of the UCRB ROD are:

- **Purpose and need.** The action alternatives (Alternatives 3 through 7) must meet the purpose of and need for the proposed action, described earlier in this chapter.

- **Scale of decision.** The broad-scale nature of this planning process does not include site-specific decisions. Those will be made by local managers (District Managers, Area Managers, Forest Supervisors, and District Rangers) during smaller scale planning processes. Many decisions in this planning process are based on information and projections over periods longer than 10 years. The adequacy and completeness of some types of data at this scale requires discussion under 40 CFR 1502.22. See the Scale of Decision and Incomplete and Unavailable Information sections in Chapter 4.

- **Valid existing rights.** Nothing in this plan can override valid existing rights or permits, such as water rights, mineral leases, mining claims, rights-of-way, livestock grazing permits, awarded contracts, and special use permits. However, to meet the objectives of an alternative, some reasonable changes may be required in the way maintenance and operations are carried out.

- **Decision Space.** In formulating an array of alternatives relating to management of public lands in the planning area, it is important for the decision space to be well defined and understood. That is, the decisions deciding officials *can* make (including management activities and intensities on lands they administer) and *can not* make (including activities on lands they do not administer), or decisions assigned to another agency, such as changing water rights, which fall under state jurisdiction. The decision space should demonstrate the degree of flexibility for management, and expected outcomes of land management actions at the landscape level (on each Forest Service Ranger District or BLM Resource Area).

  Various Federal and State laws, such as the Clean Water Act, Clean Air Act, Endangered Species Act, and National Forest Management Act have minimum requirements or conditions (thresholds) that must be attained prior to or while conducting management activities. While these thresholds may define the lower limits of a decision space, the upper limit is often bounded by the biological potential, or maximum capabilities of the land and resources. This then allows for a range of management options between the thresholds and the biological potential. Selection of a preferred alternative within that range of management options can then be focused on social, economic, or special resource considerations. In general, a combination of social, economic, and resource values will be greatest somewhere short of maximizing any one value, except where very limited opportunities, or rare and sensitive species or habitat conditions exist.

- **Other planning efforts (Federal, State, tribal, and local).** Other Federal agencies, as well as State, tribal, and local governments have been actively involved in the public involvement process for this Draft EIS as provided in NEPA, NFMA, FLPMA, and other regulations. During the comment period on the Draft EIS, there will be further opportunities to resolve conflicts.

  BLM planning regulations require that its resource management plans be consistent with officially approved or adopted resource-related plans, and the policies and procedures therein, of other Federal, State, and local agencies, and Indian tribes, so long as the resource management plans would still be consistent with applicable Federal laws and regulations (43 CFR 1610.3-2)

  The Council on Environmental Quality regulations in 40 CFR 1502.16(c) require a discussion of "possible conflicts between the proposed action and the objectives of Federal, regional, State, and local (and in the case of reservation, Indian tribe) land-use plans, policies and controls for areas concerned." FLPMA and NFMA require that Federal land management agency plans identify consistencies and inconsistencies with other land-use plans, such as planning and zoning efforts of local governments. The geographic scope of the project's EISs, involving over 100 counties in the interior Pacific Northwest, make a consistency review effort more challenging.

  One effort undertaken during the planning process to ensure consistency with local planning efforts involved the collection and review of a large number of county land-use, economic development, and other plans which were submitted in late 1994 and early 1995. A summary report, the *County/Community Vision Statement Project*, completed in August 1995, reviewed 32 such plans. Additional plans submitted to the project were also reviewed. The Eastside Coalition of Counties assisted the project by requesting that local governments in the area provide copies of their plans to the project for review.

  State and tribal plans were considered when analyzing cumulative effects for the UCRB EIS.

The project also reviewed other plans of other agencies, including but not limited to, Idaho Governor Philip E. Batt's proposed Bull Trout Conservation Plan.

◆ **Relationship to Federal, State, and local environmental protection laws.** The UCRB EIS was prepared with full consideration of all relevant laws, regulations, and executive orders. Decisions must be consistent with many Federal laws, including the Federal Land Policy and Management Act, National Forest Management Act, Endangered Species Act, the American Indian Religious Freedom Act, National Historic Preservation Act, the Clean Air Act, and Clean Water Act (see Appendix A for a list of the most relevant Federal laws).

Under the Endangered Species Act, Federal activities that may have an effect on threatened or endangered species are subject to consultation with the U.S. Fish and Wildlife Service (FWS) or the National Marine Fisheries Service (NMFS). (Departments of Agriculture (Forest Service), Commerce (National Marine Fisheries Service), and Interior (Bureau of Land Management, and Fish and Wildlife Service) MOU dated May 31, 1995.) Requirements for consultation will remain in effect under any selected alternative. If the selected alternative may have an effect on threatened and endangered species, biological assessment(s), appropriate for the scale of the decision, will be submitted to FWS and NMFS for consultation. Consultation will be completed prior to any ground-disturbing activities.

Some Federal laws contain provisions for State administration of specific environmental programs or for making State laws applicable to Federal lands and facilities. State and local laws relating to the health, safety, and welfare of people apply to activities on Federal lands.

Nothing in the alternatives in this Draft EIS precludes compliance or commits the agencies to any action which would violate such legal requirements. Compliance can be assured at the individual plan and project levels.

◆ **Federal trust reponsibility to Indian tribes.** There are 22 Federally recognized American Indian tribes within the ICBEMP project area, 16 of which have interests in the UCRB EIS planning effort. The Federal Government has a trust and legal responsibility to American Indian tribes, which comes from commitments made by the United States in treaties, executive orders, and agreements. Upholding these tribal rights specified in the treaties, executive orders, statutes, and agreements constitutes the Federal Government's legal responsibility. The Federal Government also has a responsibility to consult with affected tribes whenever its actions affect the resources upon which the exercise of tribal hunting, fishing, gathering, and grazing rights depend.

The following are the 16 tribes with interests in the UCRB planning area: Kalispel; Kootenai of Idaho; Blackfeet; Coeur d'Alene; Nez Perce; Colville; Spokane; Salish-Kootenai (Flathead); Shoshone-Bannock (Fort Hall); Shoshone-Paiute (Duck Valley); Paiute (Fort McDermitt); Eastern Shoshone (Wind River); Northwest Band of Shoshoni Nation (Fort Hall); CTWSR (Warm Springs); CTYN (Yakama); and CTUIR (Umatilla).

See Chapter 2 and Appendix C for more detailed discussions of American Indian Tribes.

◆ **Water rights and adjudications.** Conditions upon which this document is based are predicated on the availability of instream flows sufficient to maintain and restore channel conditions, provide for viable aquatic species such as fish, protect recreation flows in wild and scenic river areas, and provide for other needs under which the National Forests and certain BLM-administered lands were established. It is the position of the United States that the right to use water for management of public lands was reserved by the United States when the National Forests, wildernesses, wild and scenic river areas, national recreation areas, and certain BLM-administered lands were established. Those reserved water rights, as well as water rights claimed under state authority, are established through water rights adjudications and are beyond the scope of this EIS. The agencies' ability to meet the purposes for which these Federal reservations were established, are predicated on having the minimum amount of water necessary for both instream and consumptive uses. The selected alternative may have effects that are different from those described in this EIS, and may not accomplish the purpose and need of the proposed action if sufficient water is not available to manage the public lands for their intended purpose.

◆ **Mitigation measures.** The alternatives discussed in this Draft EIS were developed to implement certain themes in accomplishing the purpose and need. As a practical matter, the environmental effects of objectives and

standards for the action alternatives in the UCRB Draft EIS may require mitigation of various activities at local levels. See Chapter 4.

- **Recovery plans.** Recovery plans are technical scientific documents prepared by biological experts from Federal, State, and local agencies, and in some cases the private sector. The plans identify specific actions to be undertaken in order to conserve and recover a particular species, and they develop a plan to implement such actions. Recovery plans are formulated and carried out by a "recovery team," which itself is usually composed of a mix of Federal, State, and private sector individuals.

  The recovery plan process is one of the key focal points of the Secretary of Interior's efforts under the Endangered Species Act (ESA) to conserve and recover listed species. Although the authority to develop recovery plans was implicit in the 1973 ESA, there was no express obligation to do so. Consequently, prior to 1978, recovery planning had been relegated to a low priority within the ESA budget process.

  That year, Congress amended the ESA, requiring the Secretary of the Interior (through the U.S. Fish and Wildlife Service) to develop and implement recovery plans for the "conservation and survival" of listed species "unless he finds that such a plan will not promote the conservation of the species." The Secretary is also directed to establish a priority system for development of recovery plans in which he gives priority to those species that are most likely to benefit from such plans. The Secretary must give public notice and opportunity to comment on proposed recovery plans and take into account any comment provided prior to finalizing a recovery plan.

  For a complete list of recovery plans for species in the UCRB EIS area, see Appendix E.

- **Funding.** The ROD(s) for this EIS may affect funding levels; however, decisions on Forest Service and BLM funding are made through other processes that are outside the scope of this planning process. The alternatives (other than No-Action) (Chapter 3) and effects of the alternatives (Chapter 4) assume full funding for implementation. If full funding does not occur, then the rate of implementation will be decreased appropriately.

- **Staffing levels.** Like funding, staffing decisions are made through other processes that are outside the scope of this planning proeess. Standards will be met at any staffing level; however, the rate of implementation will be decreased appropriately if staffing levels decrease.

- **Implementation feasibility.** The feasibility of implementing the selected alternative, especially the location of those actions, must be determined by local Forest Service and BLM managers, in light of local circumstances and conditions.

Determination of Significance of Amendment Under the National Forest Management Act (NFMA)

- **Regional guides.** The BLM does not have a mandatory level of planning corresponding to the regional guides of the Forest Service. At the present time, it appears that the objectives and standards in Chapter 3 will be adopted at the Forest and BLM District planning levels. However, after the comment period following the issuance of this Draft EIS and the preparation of a Final EIS, a ROD canbe drafted which will make a determination asto whether any guide amendments will be made.

- **Significant amendments to Forest Plans.** The scale of the *Scientific Assessment* and this Draft EIS is broad enough that it is neither feasible nor appropriate to make fine-scale amendments to land-use plans. With the possible exception of the aquatic conservation strategy, the alternatives are not specific to particular Forests or BLM Districts. None of the action alternatives would require a change in the roadless areas described in existing plans. No allowable sale quantity changes are needed at this level of planning. Allowable sale quantity determinations will be made in the revisions to Forest Service and BLM land-use plans.

  In the usual forest planning situation, a Forest Supevisor determines the significant issues identified in scoping. For the ICBEMP planning process, the selection role was assigned to the

Project Managers under the supervision of an Executive Steering Committee, comprised of Regional Foresters, BLM State Directors, and Forest Service Research Station Directors. The issues identified were not appropriate or suitable to deal with in the detail described in 36 CFR 219.12.(b)- (k). Topics such as planning criteria, inventory data and information collection, analysis of management situation, and formulation of alternatives are controlled by the issues identified in scoping. This Draft EIS accomplished all of the steps in the significant amendment process as appropriate in estimating effects of alternatives, evaluation of alternatives, and selection of a preferred alternative. The Project Managers followed the Northwest Forest Plan process; the reconciliation with individual plans will be accomplished at a later date.

The figures for suitable timber acres in the individual existing forest plans, as amended by the anticipated decision here, will be adjusted when the plans are revised. In the meantime, the goals, objectives, and standards, and guidelines from the anticipated decision here, as amended into the individual forest plans, will control management activity.

The figures for allowable sale quantities in the individual existing forest plans will be adjusted when forest plans are revised. Chapter 4 estimates the timber sale volume for the future. By the time the forest plan revisions occur, the Forests and BLM Districts will have experience with the application of the standards and guidelines in the anticipated ROD and will be able to make specific adjustments to allowable salequantities.

The current forest plans evaluate roadless areas. Wilderness Acts have been enacted for Oregon and Washington with "release" language for roadless areas. Such language allows multiple-use management on areas not designated as Wilderness. Efforts have been made and Congress has had ample opportunity to consider roadless areas in Idaho and Montana for designation as Wilderness. The current decision does not need to consider this issue again at this scale. It will be considered during the forest plan revision processes.

The NFMA planning regulations require that Forest Service planning efforts establish and address management indicator species for the planning area. This requirement is not applicable to BLM. The designation of management indicator species was made for each existing Forest Service regional guide and Forest Service land and resource management plan per 36 CFR 219.19(a). The decisions made through this effort will not change those designations. Upon future amendment or revision of existing Forest Service land and resource management plans, management indicator species lists will be adjusted, as appropriate, in response to local conditions and information.

Both the public involvement and the disclosure requirements of NEPA and NFMA have been met in this planning effort.

Planning Criteria Under BLM Planning Regulations

Planning criteria, a BLM regulatory requirement, were prepared to guide development of the UCRB ecosystem-based management strategy, indicating the factors and data that must be considered in making decisions. The following general criteria were used to prepare this EIS:

- This planning action will be driven by the statement of the purpose of this action.
- The alternatives described and analyzed in this process will all (with the exception of the no-action alternative) be responsive to the statement of the need for this action and to the significant issues identified by the public.
- This planning action will be based upon the data provided in *An Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins* (Quigley and Arbelbide 1996), *An Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia Basin and Portions of the Klamath and Great Basins* (Quigley, Graham, and Haynes 1996), and on other published, peer-reviewed scientific literature.
- The alternative management strategies described and analyzed in this planning action will be no more detailed and specific than the *Assessment* and other appropriate literature, mentioned above.
- The detail and specificity of the alternative management strategies will be limited to that necessary to address the needs identified above.

Public Participation

Scoping: Invitation to the public

The scoping process required under the National Environmental Policy Act (NEPA) (40 CFR 1501.7) was followed to invite public participation and to determine the issues to be addressed. The Forest Service and the BLM sought information, comments, and assistance from Federal, tribal, State, and local agencies, and from other groups and individuals interested in or affected by the proposed action. For a detailed description of the public scoping process and a summary of public comments received during scoping, see Appendix D.

Notice of Intent (NOI) ~ The formal scoping period opened with publication of the Notice of Intent to produce an Environmental Impact Statement, which appeared in the Federal Register on December 7, 1994.

Scoping Meetings ~ The UCRB EIS scoping meeting was held simultaneously in 27 locations on January 28, 1995, via satellite. This medium was used to allow the greatest number of individuals and communities to participate in the shortest amount of time. The teleconference originated from Boise State University, Idaho, and was broadcast to 27 locations where local Forest Service and/or BLM staff were on hand to facilitate discussions. A live afternoon broadcast involved sharing and responding to comments and concerns. The scoping meeting also was broadcast over three public access television stations. The facilitated sessions were attended by a total of 928 people. In addition, anyone with access to a satellite dish within the continental United States was able to view the program. Comments were collected from all meeting sites and analyzed along with all letters, phone calls, and other comments received during the scoping period. Two additional scoping meetings were held in Salmon and Challis, Idaho, February 21 and 22 respectively. The formal scoping period concluded on April 15, 1995.

Briefings, consultations, and meetings with key publics were held throughout. See Appendix D, Public Involvement, for a list of consultation and coordination activities.

Other Government Agency Involvement. All levels of government participated extensively throughout the planning process, including the following:

Federal and State: In addition to Forest Service and BLM employees on the EIS team, the Environmental Protection Agency, U.S. Fish & Wildlife Service, and National Marine Fisheries Service provided liaisons to the team. The governors' offices in the States of Oregon, Washington, Idaho, and Montana were contacted by letter, and each was requested to designate representatives for the respective States to provide advice and recommendations to the project as allowed under the recently enacted exemption from the Federal Advisory Committee Act (FACA).

County: The Associations of Oregon, Washington, Idaho, and Montana Counties jointly formed the Eastside Ecosystem Coalition of Counties to represent counties directly affected by the ICBEMP; this coalition participated actively throughout the process. In September 1995, a Memorandum of Understanding (MOU) was signed between the ICBEMP and the Eastside Ecosystem Coalition of Counties to define the roles of project leaders and county commissioners on behalf of their State associations of counties. The MOU outlines communication between the parties and for the county elected officials to provide advice and recommendations to the project, taking advantage of a recently enacted exemption from FACA.

Tribal: The project's Tribal Liaison Group contacted 22 individual tribes, 16 of which reside within or have rights and interests in the UCRB planning area. The purpose of the contact was to help develop, based on a government-to-government relationship, a consultation process with each tribe and to work closely and continuously with each other to integrate tribal rights and interests in the planning process.

Early tribal involvement and consultation in such a complex project as the Interior Columbia Basin Ecosystem Management Project is a relatively new undertaking. All the tribes contacted have participated to varying degrees and at various times, based in part on differing interpretations of the concepts of "involvement" and "consultation". Although all the tribes have provided at least informal feedback upon request and have made significant early contributions to this process, some have chosen to provide formal consultation and official tribal comments only upon release of the completed Draft EIS. Deciding officials are committed to formal government-to-government consultation and are prepared to ensure that all tribes have the

opportunity to participate to the degree and in the way they wish before the Final EIS and Record of Decision are released.

Next steps in the Planning Process

Availability of this Draft EIS for review will be announced in the *Federal Register* and in local media. Publication of the Notice of Availability opens a period for the public to submit comments on the Draft. Documents will be mailed to those on the Distribution List (see Chapter 5) and any others upon request. Public meetings will be held in locations and at times and dates announced in the letter accompanying this document and in local media.

Commenting on the DEIS

Those who do not comment on this Draft EIS or otherwise participate in this EIS process, may have limited options to appeal or protest the final decision.

Federal court decisions have ruled that environmental objections that could have been raised at the draft stage may be waived if not raised until after the completion of the Final EIS. The reason for this is to ensure that substantive comments and objections be made available to the Forest Service and the BLM at a time when they can be meaningfully considered and responded to in the Final EIS.

To be most helpful, comments on the Draft EIS should be as specific as possible, mentioning particular pages or chapters of this document where appropriate. Comments also may address the adequacy of the Draft EIS itself, the merits of the alternatives, or the procedures followed in the preparation of this document as called for under the National Environmental Policy Act (NEPA) and its implementing regulations. Copies of NEPA and the Council on Environmental Quality (CEQ) regulations may be viewed at any Forest Service or BLM office or at your public library.

Comments received on the Draft EIS, along with comments received during scoping or at other stages of this process, will be placed into the administrative record where they will be available for public review. Commenters should thus be aware that information, such as addresses and phone numbers, may be viewed and copied by anyone with access to these public files in this open process.

After analysis and consideration of public comment on the Draft EIS, the UCRB Final EIS is expected to be released in mid 1998. Any ensuing Record(s) of Decision (RODs) will be issued following the Final in accordance with appropriate Forest Service or BLM regulations. The availability of the Final EISand ROD(s) will be published in the Federal Register and in local media. Opportunities to protest proposed decisions (BLM) or appeal decision(s) (Forest Service) will be provided in accordance with BLM and Forest Service regulations and policies.

Figure 1-1 (on page 22) shows the general steps in the planning process. Figure 1-2 (on page 23) shows the scoping results for the UCRB EIS.

Issues that Emerged from the Scoping Process

Project scoping identified the issues and concerns people have about public lands administered by the BLM or Forest Service in the upper Columbia River Basin. This information was collected for several reasons:

- ◆ To help identify what data should be collected for the UCRB Draft EIS;
- ◆ To help develop ecosystem-based management alternatives for the UCRB Draft EIS;
- ◆ To help identify environmental consequences that should be addressed in the UCRB Draft EIS.

An "issue" for planning purposes is defined as a matter of controversy, dispute, or general concern over resource management activities or land uses. To be considered as a "significant" EIS issue, an issue must be well defined, relevant to the proposed action, and within the ability of the agencies to address in the formulation of a range of management alternatives or possible mitigation measures. Other factors used to identify significant issues include the geographic extent of the issue, how long the issue is likely to be of interest, and the intensity of the level of interest or conflict generated by the issue.

The concepts of ecosystem-based management stress the integration and interrelationships of all parts and functions of an ecosystem, including the human component. The issue statements listed here therefore exhibit the integration and interdependence of all resources in each issue.

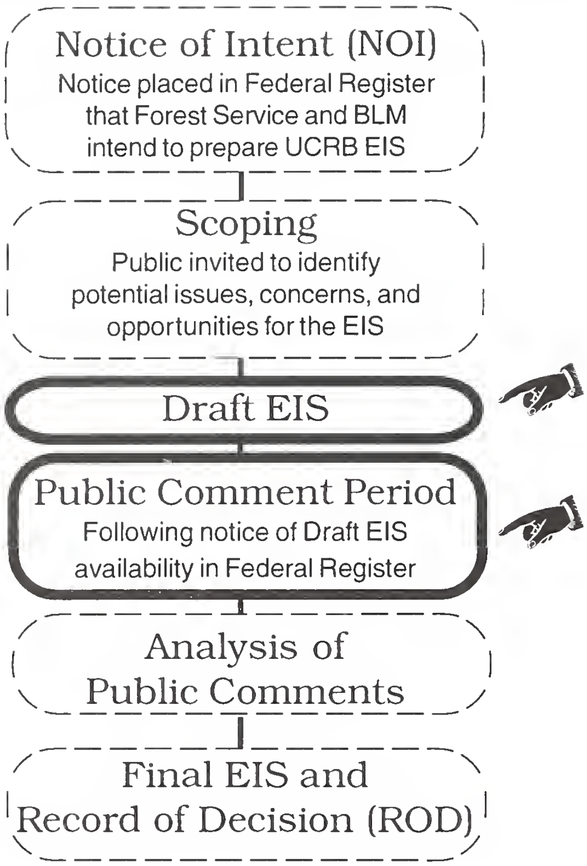


Figure 1-1 - Steps in the Planning Process

The following list of issues is the outcome of internal agency concerns and public input from scoping meetings in the upper Columbia River Basin in January and February 1995 and in eastern Oregon and Washington in May and June 1994. Both scoping sessions contributed to a preliminary set of issues, which were combined to make this final list (similar concerns were grouped where appropriate). Each issue addresses only those lands and resources administered by the BLM or Forest Service in the Interior Columbia Basin Ecosystem Management Project Area. All significant issues identified during scoping have been considered in the preparation of this Draft EIS.

1. **In what condition should ecosystems be maintained?**

   A wide range of opinions was expressed over the desired conditions to which ecosystems could or should be restored and maintained. Many comments reflected a belief in the importance of healthy, whole ecosystems and called for protection and restoration of all ecosystems and components as the desired condition. Many others questioned the desirability of achieving ecosystem "health" if it does not include humans and human uses of resources. Many comments questioned the validity, rationale, and science of using "historical range of variability" as a measure of desired condition, although some were of the opinion that the baseline of pre-European settlement is valid and useful as a baseline. Some people noted that certain changes cannot be reversed, such as human population size. Concerns were expressed over the ability to understand ecosystems and their resiliency, which would be needed to effectively restore the systems. Numerous comments focused on the dynamic nature of ecosystems and suggested that management can't be specified for any one static condition or point in time.

2. **To what degree, and under what circumstances, should restoration be "active" (with human intervention) or "passive" (letting nature take its course)?**

   Many comments favored actively managed ecosystems where we plan for active and intensive forest and range management to quickly restore environmental damage and/or to recover resources. Among these comments, several noted we can have healthy ecosystems with reduced risks (including fire and disease) with good active management. Many stated that proper management must mean long-term sustainability and must recognize the dynamic nature of ecosystems over time. Some felt that active management is desirable but only in currently roaded areas. Many other respondents felt that "human management should be minimal – the goal should be to eliminate it" and that we should let nature take its course, not interfering with natural processes. Some said to stop active management and "overmanaging" and instead manage the people who would damage public lands. Some stated it's impossible to generate a natural system by manipulation and that we should "adopt benign neglect as the preferred alternative." Many called for analysis of ecological damage due to past management activities. A number of comments called for neither active nor passive management alone, but rather holistic and adaptive management– approaching restoration slowly, using appropriate tools at appropriate times, and using extensive monitoring in order to deal with scientific uncertainty and changing conditions or knowledge.

3. What emphasis will be assigned when trade-offs are necessary among resources, species, land areas, and uses?

A wide range of opinions was expressed over whether any single resource such as declining species or timber should be given top priority and focus for management actions, or whether the entire ecosystem should be managed with equal emphasis. Questions and comments included which if any resources or species should be given focus, and where or which part of the ecosystem is more or less important. Some comments favored giving priority to streams, watersheds, riparian areas, fisheries, and water quality. Other comments said the ecological importance of unroaded areas is key and should be given top priority. Some said economic, social, and cultural needs of people should be given more priority than other ecosystem needs. Others suggested the priority be given to areas highly affected by past management activities. Some favored priority for soils, others for clean air.

With regard to wildlife, concerns ranged from requests to make the preservation or conservation of all native species a priority, to requests that no wildlife species receive priority over human needs. Some comments linked human health with the land and the organisms on it and suggested priority be given to conservation of all existing native species; some emphasized recovery of declining or threatened/endangered species such as salmon; some urged management of habitat and the ecosystem, not individual species. Some favored emphasis on core reserves and biological corridors.

4. To what degree will ecosystem-based management support economic and/or social needs of people, cultures, and communities?

A great many comments expressed concern that human needs have been underestimated and should be elevated in importance in the EIS and analyzed in depth in a meaningful way. Stability of human communities, social and economic concerns, human health and social needs, and availability of resources for public use and development were among the major concerns expressed. Some expressed a concern that a regional ecosystem approach will mask local economic and community impacts. In particular, many comments expressed a desire for management of public lands to meet current economic needs and sustain rural communities by: (1) managing for predictable or stable output levels; (2) maintaining traditional enterprises including timber, grazing, and mining; (3) helping to maintain the rural way of life, customs, and culture; and (4) finding ways to offset losses of local government revenue. Many respondents rejected suggestions that recreation, tourism, or restoration jobs could substitute for commodity-based jobs.

A great many other comments expressed the opinion that resources and long-term sustainability should take precedence over human needs, agendas, commodity targets, and special interests, and they asked that the area "be protected from humans." Many comments favored shifting from traditional single-resource-based economies to more diverse economies, including amenity-based recreation and tourism and other businesses based on quality of life and aesthetic values; these were said to enhance long-term job and community stability. Some comments favored economic diversity but objected to an emphasis on recreation because of potential impacts to the environment.

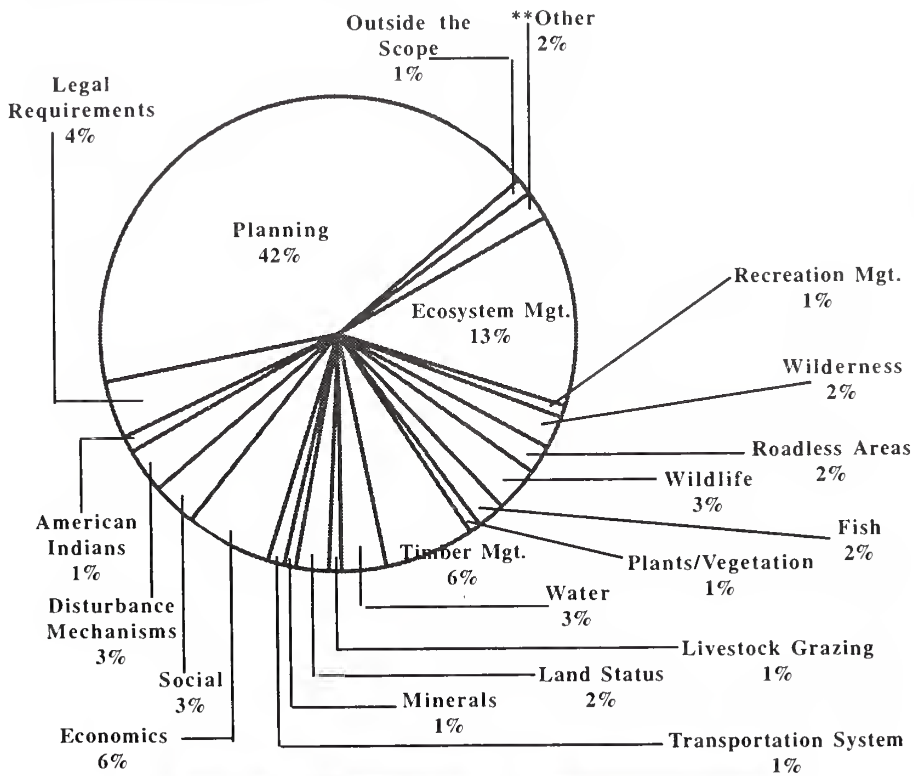
Many comments stressed the idea of balance and cooperation to satisfy the needs of all users and to lessen the conflict between human needs and ecological integrity. Many tied ecosystem health and human health closely together. Many asked that the multiple-use vision of both agencies be maintained, but opinions of what "multiple-use" means differed among respondents.

5. How will ecosystem-based management incorporate the interactions of disturbance processes across landscapes?

Many comments focused on natural disturbance mechanisms and regimes including fire, insects, disease, and climate change. Many said they recognized the role of natural disturbance but questioned how we could know historical levels of disturbance. While many expressed a desire to see natural disturbance regimes emphasized, others suggested that disturbances must be controlled to allow for crop yields, commodity production, biological diversity, or protection of human property. Numerous comments focused on the role of fire and fire management, ranging from "Leave the forests alone" to "We need to implement immediate active management." Much eontroversy was expressed regarding fire vs. logging as management techniques to mimic natural disturbance. Some comments asked for

A Piece of the Pie

During the official scoping period from January 28, 1995 through March 24, 1995, a total of 9,080 public comments were collected and recorded. The next phase was "Content Analysis;" your key issues were identified and grouped into general topics. The pie chart below illustrates those groups by percentage.



***The "Other" category represents the following: Air, Soil, Old Growth Areas, Special Uses, Energy, Hazardous Material, Wild and Scenic Rivers, Scenery and Visual Management, Special Interest Areas, Archeology, History/Cultural Reservations*

After grouping into general topics the next phase of "content analysis" is to further focus on your specific concerns. The UCRB EIS team searches for common themes. Those common themes within your specific concerns identify issues that apply across the Basin.

Examples from Your Comments

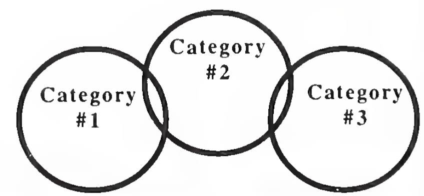
Below are three public comments taken from the general, "economics (6%)" topic. (Common themes have been highlighted.)

1. "A regional plan can help our ***communities*** envision the role of public lands in creating ***long-term, sustainable economies*** and maintaining our ***quality of life***."
2. "Timber sales are a good ***source of revenue*** for the federal and state governments. The salvage sale of dead trees ***creates thousands of jobs*** which in turn ***support schools*** and the rest of ***the community***."
3. "We believe that ***economic and social conditions*** are important parts of any ***ecosystem management*** and must therefore be included in the assessment and EIS project."

Next, the common themes were grouped into related categories. These categories are the foundation from which issues were developed.

Common Themes

Lastly, the UCRB EIS team members combined the categories by common themes to develop issues.



The formulated issue is . . .

To what degree will ecosystem-based management support economic and/or social needs of people, cultures, and communities?

Figure 1-2.

Examples of Your Comments

Comment	Issue 1	Issue 2	Issue 3	Issue 4	Issue 5	Issue 6	Issue 7
Rathrum, ID "It must be recognized that all ecosystems are in some seral stage of development. Decisions are made whether to interrupt, maintain or allow succession to naturally occur."	√	√					
Idaho Falls, ID "Should the focus be 'to restore' or 'to maintain' or both?"	√	√			√		
Columbia Falls, MT "So what will rule, the single species management of the resources, or management of the health of the ecosystem as a whole?"	√		√				
McCall, ID "Proper ecosystem management should be to minimize the extreme conditions and manage for the mean and in the process receive valuable products for mankind."	√	√	√	√		√	
Elko, NV "How is irrigation water going to be affected; adjudicated and invested water rights?"			√				
Kalispell, MT "Draft document seems to focus mainly on the physical and biological considerations with the human/social considerations 'tacked on' at the end."	√		√	√			
Boise, ID, "Many recreationists are concerned about access restrictions that the EIS may bring about."			√			√	
Salmon, ID "Protect the custom and culture of all Americans as well as Native Americans."						√	√
Victor, MT "Natural fire sounds good, but it may be conditional on the public's acceptance of smoke, the tolerance for burned trees, etc."		√	√		√		

Your *Comments* Led to These Issues

1. In what condition should ecosystems be maintained?
2. To what degree, and under what circumstances, should restoration be "active" (with human intervention) or "passive" (letting nature take its course)?
3. What emphasis will be assigned when trade-offs are necessary among resources, species, land areas, and uses?
4. To what degree will ecosystem-based management support economic and/or social needs of people, cultures, and communities?
5. How will ecosystem-based management incorporate the role of natural disturbance processes?
6. What types of opportunities will be available for cultural, recreational, and aesthetic experiences?
7. How will ecosystem-based management contribute to meeting treaty and trust responsibilities to American Indian Tribes?

identification of socially acceptable patterns of social, economic, and biophysical disturbances and a discussion of levels of risk.

6. **What types of opportunities will be available for cultural, recreational, and aesthetic experiences?**

   Considerable variety in cultural, recreational, and aesthetic uses of public lands was evident from the comments. Some people value public lands for elements of natural and scenic beauty, purity, and open spaces that provide aesthetic and spiritual experiences; others value the lands more for material outputs that help to sustain desired lifestyles and cultural practices. People also value public lands for the reservoir of natural conditions they wish to see maintained for the sake of future generations. General comments regarding recreation ranged from support for recreation and tourism as benefits of healthy forests, to requests that more emphasis be placed in the EIS on recreation and recreation values, to statements that there is too much push for recreation. Concerns were expressed about the loss of recreation opportunities both short and long term due to wildfire, that site-specific aspects of access be addressed, and that land as well as water recreation opportunities be analyzed. Some considered recreation to be a way to solve problems while others saw recreation as a management problem in itself based on potential damage to visuals, wildlife habitat, and other resources from recreation and tourism. Several comments questioned how visual management will be accommodated with other activities and needs such as fire management and forest health. Some asked for aesthetics to take priority over recreation and other activities. A great many comments supported the protection and/or creation of wilderness, roadless, and other core protected areas both for wildlife protection and for opportunities for wilderness recreation and aesthetic experiences; many others objected to setting aside unmanaged core reserves or roadless corridors.

   A key component of comments under this issue relate to access and roads for recreational, cultural, and aesthetic experiences as well as for economic and management activities. Some comments requested improved access to Wilderness and recreation areas, while others suggested that road densities be reduced especially in areas to be protected for wilderness or "roadless" values. Controversy exists over the damage roads have caused in the past and over the potential environmental risks from using or constructing roads to accomplish future restoration and management compared to the risks associated with lack of road access (for example, for fire fighting access).

7. **How will ecosystem-based management contribute to meeting trust responsibilities to American Indian tribes?**

   American Indian tribes retained rights and privileges under treaties and agreements negotiated with the U.S. Government, and the law made Federal agencies responsible for protecting off-reservation trust resources that occur on lands administered by those agencies. Tribal rights and interests in the management of resources sometimes conflict with the interests of groups with other cultural perspectives. Comments included concerns that ecosystem-based management adequately provide for rights and privileges reserved by tribal treaties and agreements, particularly hunting and fishing rights. Several comments stated a need for the EIS to analyze American Indian issues and concerns as well as to assess impacts to American Indians and reservations. Other comments expressed concerns that tribal input and consideration should be equal to but no more a priority than non-Indian considerations, and that non-Indian hunting and fishing rights also be addressed. Several comments questioned how the tribes would be tied into the EIS process.

Additional Concerns

Comments listed below represent concerns and questions raised during scoping that were considered but not used as driving issues in alternative development for one or more of the following reasons: their resolution falls outside the scope of this project, they have already been decided by law or regulation, they are not relevant to the decision, they are not supported by scientific evidence, or they are limited in extent, duration, or intensity.

Skepticism over basic assumptions and conditions of ecosystem health

Response: *The agencies have based their assumptions of ecosystem health problems and conditions in the Columbia River Basin on sound scientific information including the integrated assessment prepared by the Science Integration Team, professional observations and experience, and evidence of ecological, social,*

and economic changes that can be directly or indirectly linked to declining ecosystem conditions. The conditions are described at various scales, but it is recognized that site-specific conditions vary from location to location and there may be individual sites where ecosystem health problems are less prevalent than the overall picture portrays.

Mistrust of government, the agency, the individuals involved

Response: *The agencies recognize the existence of mistrust or disapproval of government agencies and employees among some individuals, groups, or organizations. General mistrust does not drive the development of the range of alternatives in an EIS process. However, responding to such feelings is a focus for public involvement efforts connected to this EIS, since one desired outcome for a successful ecosystem-based management strategy is a fully informed and participating public. Meaningful public involvement is a key component of all alternatives described in this EIS.*

Disapproval of ecosystem management as a concept

Response: *We believe that the Forest Service and the BLM can better address broad issues using a scientifically sound ecosystem-based management approach. Direction to develop a scientifically sound ecosystem-based strategy for lands in the interior Columbia River Basin that are administered by the Forest Service or the BLM came from the President as well as from the Chief of the Forest Service and Director of the BLM. Stopping the ecosystem-based management process is not an alternative that addresses the need for this project.*

Comments regarding video teleconference and scoping process

Response: *Individual comments suggesting improvements to the teleconference process have been noted and will be considered should a similar process be used in the future.*

Communications: terminology, language, presentation of concepts too complicated and unclear

Response: *Plain and clear language is an important feature of the EIS process. Efforts have been made to reduce technical terms, acronyms, and jargon. Efforts also have been made to express complex concepts in a clear and understandable fashion, both in the EIS and in other communications with the public. A readable glossary has been provided in the EIS.*

Scale, scope, and timing of the project are inappropriate (too large, too small, too slow, too fast)

Response: *The President of the U.S., the Chief of the Forest Service, and the Director of the Bureau of Land Management all acknowledged a need for a project of this scale and scope in order to more effectively manage agency lands in the interior Columbia River Basin. The project was divided into two similar and simultaneous EISs to enable adequate analysis and presentation of environmental consequences of alternatives, but a single comprehensive scientific assessment was prepared for the entire area to provide a consistent basin-wide foundation of information. Where appropriate, management options examined in the two EISs focus on basin-wide issues; in other places direction is more regional or local where conditions warrant different attention. For the most part, site-specific direction has been deferred to local decision-makers who are more familiar with individual site conditions and local needs.*

Impacts on private lands and private or States rights (such as water rights)

Response: *Regulation of private or State land is not within the decision makers' jurisdiction, and therefore was not considered in the UCRB EIS. Information about conditions and uses on private lands in the basin was included in the Scientific Assessment so that the EIS team could fully understand the entire landscape and adequately consider cumulative effects of the alternatives. Water rights and allocation fall under the jurisdiction of State governments and were not considered in the EIS. All decisions made as a result of this EIS apply only to applicable Forest Service- or BLM-administered lands.*

Concerns regarding local values, conditions, and control of management and decision making

Response: *Public involvement has occurred and will continue to occur at local, regional, and national levels, all of which are appropriate to federally managed public lands. The Forest*

Service and the BLM retain the authority to make decisions on use of the lands and resources they administer. These decisions are made in an open process using public input, including but not limited to local individuals, organizations, and governments. Local, county, and State government involvement in planning, decision-making, and implementation of programs is a key component of all action alternatives in this EIS.

Role of science in EIS and in management

Response: *It is important for Federal agencies to consider and respond to new scientific information in a timely and professional manner. Ecosystem health problems can be more successfully resolved by using the best available science to design plans dealing with issues that transcend agency boundaries, such as species population viability, forest health, aquatic health, and related cumulative effects. Science can help define what is possible and it can help people understand the estimated costs, benefits, and consequences of alternative courses. Important links also exist between legal requirements and the role of scientific information. For example, in the Pacific Northwest, the Forest Service and the BLM were found in violation of Federal laws and regulations in part for failure to consider new scientific information on the spotted owl. Consideration of new and relevant scientific information can be accomplished more easily and efficiently by incorporating science as an integral part of the EIS process, as has been done with this project.*

Impacts of dams and other activities off Federal lands affecting anadromous fish

Response: *The management of dams, ocean fish harvest, and other activities or conditions that occur off Forest Service System or BLM-administered lands is outside the jurisdiction of the Forest Service and the BLM. However, recognition and consideration were given in the EIS as to how those management activities and conditions off Federal lands affect the resources, particularly fish, that inhabit Forest Service- or BLM-administered lands. Consideration of these activities and conditions also played a role in evaluating the cumulative effects of the alternatives. Even though conditions or actions outside agency jurisdiction ~ such as dams ~ may be major contributors to ecosystem health problems throughout the basin, the agencies retain a responsibility to properly manage the lands they administer and to avoid contributing further to the problems.*

Need to reconsider existing land allocations, recognizing that current conditions will not support sustainable fish populations.

Response: *The project purpose to produce a scientifically sound, ecosystem based management strategy for BLM and National Forest System lands does not specifically require the agencies to re-analyze land allocations. Such analysis is more appropriate at the level of the land-use plan for the local administrative unit (BLM Resource Area, Forest). Furthermore, preliminary results from the Scientific Assessment do not indicate a need to re-analyze existing land allocation in this EIS at the broad scale. However, designating land as large terrestrial reserves will be analyzed in Alternative 7, and designating land as riparian conservation areas will be analyzed in Alternatives 2 through 7.*

Questions about how EIS will handle Roadless Areas and Wilderness considerations

Response: *All Roadless Areas and Wilderness Study Areas have already been evaluated and considered for recommendation as potential Wilderness Areas during the development of land-use plans. The scale for this EIS decision is inappropriate for individual Roadless Area evaluations for Wilderness potential. In addition, the purpose and need and Notice of Intent for this EIS focus on ecosystem-based management, without mention of Wilderness potential. Decisions are intended to be based on ecosystem function and not necessarily on political allocations.*

Need to reserve currently unroaded areas greater than 1,000 acres

Response: *The fundamental intent of this project is to maintain and restore ecosystem health and integrity and support the social and economic needs of people, not necessarily to preserve currently unroaded areas. For aquatic/riparian habitats, it is considered to be more important to address the needs of dependent species rather than the social issue of how much roadless area to preserve. Preservation of unroaded areas may be one way to maintain and restore ecosystem health and integrity and support people, but it is not the only way. Unroaded areas greater than 1,000 acres would be mostly left unroaded under Alternative 7.*

How does this Draft EIS address the topic of "old growth"?

Response: *The term "old growth" was not used as an ecological descriptor, and the Draft EIS does*

not state objectives for "old growth." Old-growth is a social value or issue, related to but separate from mature and old forest structure. The Draft EIS uses "mature" and "old"* multi-story and mature and old single story structural stages to refer to mature and old forest conditions. These conditions vary in terms of size, age, density, shade-tolerance, and overall habitat characteristics based on the species composition and the sites where they occur, as they are adapted primarily to distinct fire regimes.*

Mature and old multi-story forest refers to mature forest characterized by two or more canopy layers with generally mature and old trees in the upper canopy. Understory trees are also usually present. Old multi-story can include both shade-tolerant and shade-intolerant species and generally is adapted to a mixed fire regime of both lethal and nonlethal fires.

Mature and old single story forest refers to mature forest characterized by a single canopy layer consisting of mature and old trees. Understory trees are often absent, or present in randomly spaced patches. Old single story forest generally consists of widely spaced, shade-intolerant species such as ponderosa pine and western larch, adapted to a nonlethal, high frequency fire regime.

The Draft EIS discusses mature and old multi-story and single story structural stages by potential vegetation group (PVG) in terms of: past conditions and current trends, desired range of future conditions (DRFC), and objectives to reach the DRFC.

Because old multi-story and old single story structural stages may or may not contain the various characteristics sometimes identified with "old growth," there is not, nor was there intended to be, a direct correlation between the two in this Draft EIS.

["Mature" refers to ages and sizes of dominant trees that are at least at culmination of mean annual increment of tree stand volume growth. "Old" refers to ages and sizes of dominant trees that are significantly beyond what may be found at culmination of mean annual increment of tree stand volume growth.]*

Funding to implement the project: too much, too little, too political, where will it come from?

Response: *The alternatives in the EIS include various funding and implementation levels. The decision-makers do not have authority to ensure that funding is available; funding levels fall under the authority of the U.S. Congress.*

Government reorganization/reinvention and political influence on project

Response: *Government agency reorganization and reinvention efforts are beyond the scope of the decisions being made with this project. The UCRB EIS displays the consequences of any decisions that might be made in the Record(s) of Decision. To the extent that elected officials represent the people who are the owners of the public lands, politics has a role to play in the decision to be made. However, the level and nature of political influence on the funding or fate of the project is beyond the scope of analysis for the EIS.*

Questions regarding agency coordination, accountability, enforcement, implementation

Response: *The Forest Service and the BLM were directed to use a collaborative and coordinated approach in developing this EIS, consistent with the law and with agency planning regulations. Coordination was accomplished with numerous Federal, tribal, State, county, and local government agencies. The implementation plan associated with the Record(s) of Decision for this project will describe in detail the steps and expectations for continued agency coordination, accountability, enforcement, and implementation of the decision(s).*

Changing the amount of subsidies for recreation, timber, mining, and ranching

Response: *Resolution of this concern is outside the scope of the UCRB EIS and is more appropriately addressed by Congress.*

Laws: call for blanket review of laws (for example, Endangered Species Act)

Response: *Resolution of this concern is outside the scope of the UCRB EIS and is more appropriately addressed by Congress.*

Privatization of public lands: for privatization, against privatization

Response: *Resolution of this concern is outside the scope of the UCRB EIS.*

Availability of the Planning Record

The UCRB Planning Record documents the process of producing this EIS. Documents in the Planning Record are available by request under the Freedom of Information Act (FOIA) from the UCRB, 304 No. 8th St., Boise, ID 83702, tel. (208)334-1770, fax (208)334-1769. Local forest plans and resource management plans may be viewed at the appropriate Forest Service and BLM offices or at public libraries. Other referenced documents may be viewed at the UCRB office, or at the Eastside Ecosystem Management Project office, 112 E. Poplar St., Walla Walla, WA 99362; phone (509) 522-4030, fax (509) 522-4025; TTY (509) 522-4029.

More information may be obtained through the Internet at: http://www.icbemp.gov

UCRB Chapter 2 Affected Environment

Contents

Introduction

Key Terms Used in This Section

Cluster ~ Group of subbasins where vegetative and ecological conditions and processes are similar.

ERU ~ Ecological Reporting Unit ~ A geographic mapping unit developed by the Science Integration Team to report information on the description of biophysical environments, the characterization of ecological processes, the discussion of past management activities and their effects, and the identification of landscape management opportunities.

HUC ~ Hydrologic Unit Code ~ A coding system developed by the U.S. Geological Service to identify geographic boundaries of watersheds of various sizes.

Planning Area ~ In this EIS, refers to either the UCRB EIS area or the Eastside EIS area.

Project Area ~ In this EIS, refers to the entire Interior Columbia Basin Ecosystem Management Project area, encompassing both EIS planning areas.

Subbasin ~ Equivalent to a 4th-field Hydrologic Unit Code (HUC), a drainage area of approximately 800,000 to 1,000,000 acres. Hierarchically, subwatersheds (6th-field HUC) are contained within a watershed (5th-field HUC), which in turn is contained within a subbasin (4th-field HUC). This concept is shown graphically in Figure 2-2 in Chapter 2.

Purpose and Organization of This Chapter

The purpose of this chapter is to describe the existing environment, including conditions and trends, that will be addressed by management alternatives in Chapter 3 and Chapter 4. Descriptions focus on lands administered by the Forest Service or Bureau of Land Management (BLM) in the Upper Columbia River Basin (UCRB) (the *planning area*); however, discussion of the entire *project area* (covered by both the Eastside and Upper Columbia River Basin EISs) is often necessary to provide context.

Information about the physical, terrestrial, aquatic, and human settings is provided to:

- Show more specifically changes from historical to current times within the project/planning areas,
- Describe more fully the statement of needs explained in Chapter 1, and
- Lay the foundation for understanding and evaluating the alternatives discussed in Chapters 3 and 4.

Information in the first part of the chapter is organized by potential vegetation groups (PVGs) and summarized where appropriate by ecological reporting units (ERUs), explained below. At the end of the chapter this information is integrated and reorganized into clusters of geographical areas where overall ecological conditions, management opportunities, and risks are similar in the project area.

This chapter focuses on portions of the environment that are directly related to conditions addressed in the alternatives. The description of the affected environment is not meant to be a complete portrait of the project area, which is provided in more detail in the Integrated Scientific Assessment (Quigley, Graham, and Haynes 1996) and associated Staff Area Reports (STARs) (Quigley and Arbelbide 1996). Rather, it is intended to portray the significant conditions and trends of most concern to the public, the Forest Service, or the BLM with regard to lands administered by these two agencies within the project area, at a regional scale. Information in this chapter is based primarily on the Assessment and STAR reports. Other sources are noted where applicable.

The Scientific Assessment characterizes the entire project area, regardless of ownership, to set a context within which individual BLM or Forest Service administrative units can plan and

conduct ecosystem-based management. Findings in the Assessment are best used to understand trends on the overall landscape. Descriptions of site-specific conditions can generally be found in current land-use plans available at local Forest Service or BLM offices. Readers should be aware that local conditions may reflect improved or healthier conditions, or more degraded conditions, than are discernible at the larger or regional scale addressed by this EIS.

Historical Range of Variability

Throughout this chapter, reference is made to "historical conditions" or the "range of historical variability." "Historical" in this EIS is intended to represent ecological conditions and processes that are likely to have occurred prior to settlement of the project area by people of European descent (approximately the mid-1800s). Historical ecological conditions and processes are portrayed in this EIS for a number of variables such as forest and range vegetation types, compositions, and structures; fish and wildlife habitats and populations; and fire regimes. These historical ecological conditions would have varied over time within an estimated range of variability. For purposes of comparison to current conditions, historical ecological conditions referenced in this EIS generally represent an estimated mid-point within the historical range of variability (see Figure 2-1.)

The historical period of pre-European settlement was selected for this EIS **only as a reference point**, to establish a baseline set of ecological conditions for which sufficient scientific or historical information is available to enable comparison to current conditions. Such a comparison is valuable to understand how ecological processes and functions operated with human uses, but prior to high human populations and contemporary technology. This can provide clues and blueprints for designing management strategies that maintain the ecological integrity of those processes under future management strategies. It is recognized that in many cases, it is neither desired nor feasible to return to actual historical conditions.

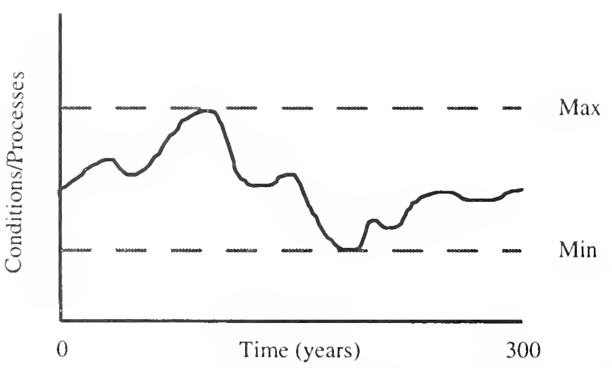


Figure 2-1. Historical Range of Variability.

Positive Ecological Trends

The nature of the Interior Columbia Basin Ecosystem Management Project has been to focus on what is going wrong with ecosystems, then to determine what changes to management activities are necessary to improve ecological conditions. Much of the discussion in Chapter 2 emphasizes these needed changes.

Although some ecosystems have declined in health, many ecological conditions and trends have improved in the past two decades due to BLM and Forest Service management activities. Some areas where improvement has been achieved over the past 10 to 20 years on Forest Service- or BLM-administered lands are as follows:

- Soil productivity ~ best management practices in use today reflect improved understanding of the sensitivity of soils to various treatments, especially at the fine scale.
- Road construction and management ~ best management practices in use today reflect improved understanding of negative effects of roads, new road construction and maintenance of permanent roads occurs with greater understanding of drainage, erosion potential, fish passage concerns, slumpage problems, and other hazards. Much remains to address in the future especially with secondary and closed roads.
- Range management and range conditions ~ the current condition of rangelands appears to be the best it has been since the turn of the century; however, this is not agreed upon by all (National Research Council 1994). The declining condition of riparian areas has, for the most part, been slowed or stopped, and managers are acquiring a better understanding of how to alleviate the negative effects of

management practices on riparian areas. The BLM and Forest Service are placing a heavy emphasis on proper management of riparian areas in land use plans.

- Many high-profile endangered species are protected ~ species such as the grizzly bear and bald eagle have recovery plans in place, which are being implemented. Attention has shifted to those species with less public attention. Probably no vertebrate species have become regionally extinct in historical times.

- Landscape approach recognition ~ overall, land managers within the project area have recognized the need for a landscape approach to management of resources; on-the-ground managers appear ready and willing to accept the change.

- Prescribed fire techniques ~ techniques available for prescribed fire within the project area have improved. A variety of conditions can now be achieved from the application of prescribed fire using different treatments.

- Forest management approaches ~ the last 10 years have seen substantial change in the treatments applied to forested areas, both in harvest techniques and silvicultural treatments. Managers have a wider array of options to select as treatments with more benign effects.

- Recognition of exotic species and their influence ~ the relatively recent and rapid expansion of exotic species and their impact on ecosystems is receiving more attention by resource managers, who recognize that management aimed at preventing the spread and reducing the extent of exotics is necessary. Scientists are testing and developing combinations of control methods that are promising for control of exotic plant species.

- Interaction with a wide array of publics ~ recent trends have been for managers to have more open discussions earlier in planning processes with a wide array of publics.

How Information was Gathered and Presented

Ecological Reporting Units

The project area was divided into 13 geographic areas called Ecological Reporting Units (ERUs) to provide a consistent way for all staff areas to report

Ecological Processes and Functions

The terms "ecological processes" and "ecological functions" in general refer to the flow and cycling of energy, materials, and organisms in an ecosystem. The nitrogen, carbon, and hydrologic cycles, and energy flow in terrestrial systems, are among the ecological processes discussed in other sections of this chapter. The following are some additional functions and processes that are important to ecosystem health:

- **Water capture.** Sites are able to effectively capture water when they maintain high infiltration rates and a high capacity for surface capture and storage of water.

- **Water storage.** Water is stored well when soil is stable and able to retain moisture; and when soil organic matter, well dispersed litter, and plant canopies that reduce evaporation losses from the soil are maintained.

- **Water cycling.** Water is cycled more effectively when it is released from a site in such a way that (1) low amounts of sediment are transported in runoff, (2) there is sufficient subsurface flow of water, and (3) plants and animals are able to use water for physiological functions.

- **Nutrient and energy cycling.** In healthy ecosystems, nutrients cycle and energy flows through a system in a pattern that is appropriate for the geoclimatic setting.

- **Energy capture (photosynthesis).** Plants are able to store resources necessary for drought survival, overwintering, and new growth initiation. They retain canopy cover, litter, and root systems sufficient to protect them from death or loss of vigor during stress periods.

- **Adaptation.** Animals have evolved along with their environments and have adapted to conditions on the landscape. Healthy ecosystems have sufficient food, cover, and other habitat attributes to maintain sufficient populations for reproduction,genetic interactions, and long-term survival.

their findings in the Scientific Assessment and Staff Area Reports (see Map 1-1, in Chapter 1 for ERU boundaries). The ERUs were developed specifically for consistent reporting purposes, not for analysis or implementation. The 13 ERUs were identified by a process that integrated human uses and terrestrial and aquatic ecosystem data. They are the basis for reporting information on the following: (1) the description of biophysical environments, (2) the characterization of ecological processes, (3) the discussion of past management activities and their effects , and (4) the identification of landscape management opportunities.

The UCRB planning area consists of five ERUs (8, 9, 11, 12, 13) unique to the UCRB and four ERUs whose boundaries overlap with the Eastside EIS planning area (5, 6, 7, 10). When possible, descriptions of the affected environment are described by ERU; however, not all socio-economic or ecological processes conform to ERU boundaries. Where this occurs, discussions are within the appropriate context.

Hydrologic Unit Codes

For the purposes of analyzing and summarizing much of the physiographic, aquatic, and vegetative information collected in the Scientific Assessment, watersheds and watershed boundaries were identified by the Science Integration Team as part of the Interior Columbia Basin Ecosystem Management Project process. The identification system follows the numeric coding system known as Hydrologic Unit Codes (HUCs) used by the U.S. Geological Survey (USGS) (figure 2-2). For larger watersheds ("Regions", "Subregions", "Basins", and "Subbasins", respectively coded as 1st through 4th field HUCs), boundaries and their numeric codes were adopted without change from those identified by the USGS. There are 164 fourth field HUCs in the interior Columbia Basin. Smaller watersheds ("Watersheds" and "Subwatersheds" or 5th and 6th field HUCs) were identified as part of the Interior Columbia Basin Ecosystem Management Project process. Within the ICBEMP project area there are approximately 8 to 9,000 subwatersheds or 6th field HUCs, which have an average area of approximately 20,000 acres each. (See table 2-13 in the Aquatic Ecosystems section for examples.) These subwatersheds were the basic characterization unit for the Scientific Assessment and were the basic mapping unit for identifying ERUs. Therefore, the boundaries of ERUs coincide with subwatershed boundaries. The subwatersheds mapped as part of this project do not necessarily match those that have been previously mapped by administrative units of the Forest Service or BLM.

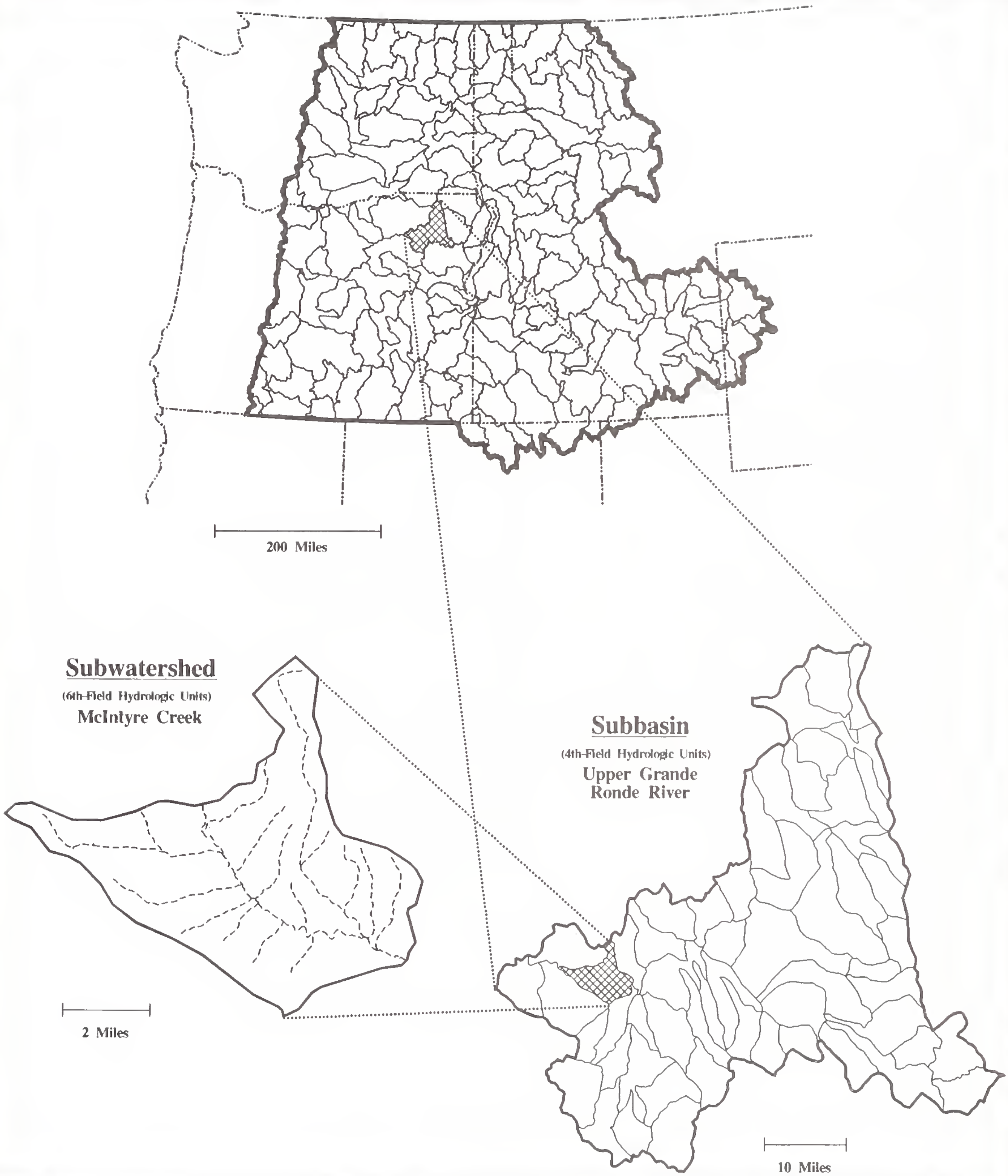
Clusters

As a final step in the analysis, to provide a more integrated picture of the affected environtment, the Science Integration Team regrouped initial information to evaluate the relative integrity of ecosystems in the project area (SIT, 1/3/96 draft). Rather than simply describe the vegetation and other individual resources, this effort now attempted to answer three questions:

1. Where are the areas of high or low ecological integrity across the project area, relative to one another?
2. Where are the opportunities to improve integrity?
3. What risks to integrity exist from management actions?

New groupings or "clusters" of subbasins were mapped, denoting forest and range ecosystems in the basin where the condition of the vegetation and ecological functions and processes are similar, and where management opportunities and risks are similar. These clusters form the basis of discussion in the last part of this chapter and for the development of alternatives in Chapter 3.

Figure 2-2. Hydrologic Hierarchy



LEGEND

State Boundaries
Project Area
Outer HUC Boundary
4th-Field Hydrologic Units
6th-Field Hydrologic Units
100k Stream Layer

Ecological Integrity and Ecosystem Health

The Science Integration Team (SIT) used the term "integrity" to refer to the ecological conditions of an ecosystem. Integrity generally means the quality or state of wholeness or being complete and unimpaired. Ecological integrity specifically was used by the SIT as a measure of the presence of physical and biological processes, patterns, and functions.

Because there are no direct measures of integrity, "proxies" or substitutes were selected to represent the broad array of functions, processes, and conditions. For example, the proportion of the area where fire severity and frequency had changed between historical and current periods was used as one of the proxies to represent such elements as consistency of tree stocking levels with long-term disturbances and the effect of wildfire on the composition and patterns of forest types. Proxies such as these were used to estimate current conditions and project trends in integrity into the future.

Ecological integrity is difficult to measure directly for several reasons. First, we can never know exactly what is in any particular ecosystem, because of the size, complexity, and ambiguous nature of most of their parts and processes. Second, the structure, function, and composition of ecosystems are always changing. Third, ecosystem changes are only partially predictable; they respond to a combination of internal processes and outside influences. And finally, the boundaries we put on ecosystems are artificial lines, making it hard to know when you are looking at an entire system or a part of one or more systems.

Therefore, integrity was estimated in a relative sense. Where forest, rangeland, and aquatic system processes and functions were present and operating best in the project area, integrity was rated higher than areas where these functions and processes were not operating. These estimates represented such elements as water cycling, energy flow, nutrient cycling, and maintenance of viable populations of plants and animals.

The notion of ecological integrity is part of the broader concept of ecosystem health used in the Draft EIS. The EIS Teams used the term "health" to refer to the capacity of forest, rangeland, and aquatic ecosystems to persist and perform as expected or desired in a particular area. Varying degrees of "wholeness" or integrity may be needed to enable a particular place to be used in the manner desired by society both now and in the future. Some uses will demand different mixes of fire regimes, water cycles, and energy flow resulting in differences in productivity, resilience, and renewability. The mix of these elements of "integrity" that would allow us to achieve a particular management objective in a particular place will define what is "healthy" for that area.

For example, in some areas such as near developed recreation sites or areas with scattered homes, restricting the presence of fire as a process may be important to achieving the broad goals for an area. The result may mean lower ecological integrity than if the fire regimes were allowed to operate fully, but might be judged as healthy from an ecosystem perspective because it is meeting the expectations of society. Another example might be managing to restrict riparian flooding, which from an ecological frame of reference would reflect lower integrity than if the flooding were to be present, yet this area might contribute to the overall ecosystem health because it is favorably contributing to society's goals.

Ecosystem "health" thus can be thought of as encompassing both ecological integrity and what people want to do with the land. Ecosystem health includes not only how "intact" the ecological processes and functions need to be compared to their capabilities in order to accomplish current and future management objectives, but it also includes measures of social and economic resiliency, management philosophies and goals, and other human factors.

Physical Environment

Key Terms Used in This Section

Air Pollutants ~ Any substance in air that could, if in high enough concentration, harm humans, other animals, vegetation, or material. Air pollutants may include almost any natural or artifical matter capable of being airborne, in the form of solid particles, liquid droplets, gases, or a combination of these.

Air Quality ~ The composition of air with respect to quantities of pollution therein; used most frequently in connection with "standards" of maximum acceptable pollutant concentrations.

Climate ~ The composite or generally prevailing weather conditions of a region throughout the year, averaged over a series of years.

Geologic processes ~ The actions or events that shape and control the distribution of materials, their states, and their morphology, within the interior and on the surface of the earth. Examples of geologic processes include: volcanism, glaciation, streamflow, metamorphism (partial meting of rocks), and landsliding.

Geomorphology ~ The geologic study of the shape and evolution of the earth's landforms

Physiography ~ Pertaining to the study of the formation and evolution of landforms.

Soils ~ The earth material that has been so modified and acted upon by physical, chemical, and biological agents that it will support rooted plants.

Soil productivity ~ The capacity of the soil to support plant growth, due to the physical and chemical characteristics of the soil, including depth, temperature, water-holding capacity, and mineral, nutrient, and organic matter content.

Tectonic ~ Relating to, causing, or resulting from structural deformation of the earth's crust.

Introduction to Physical Environment

Geology, geologic processes, and climate form the physiographic framework in which ecological processes operate. For the most part, geologic and climatological conditions, processes, and disturbances cannot be modified by management activities. Watershed, soil, and atmosphere conditions and processes, also part of the physiographic setting, can and have been modified by management activities. All of these elements, whether they can be affected by management activities or not, must be accounted for when designing management strategies that will have a high likelihood of achieving desired outcomes.

The material presented here focuses on those geologic, soil, climatological, and air quality issues that are relevant for regional- and sub-regional-level ecosystem management (see chapter 1 for definitions of regional and sub-regional). Much of the information forming the basis of this section is derived from the Landscape Ecology and Aquatic Staff Area Reports (1996), reports of the Eastside Forest Ecosystem Health Assessment (Everett et al. 1994), and additional sources as cited.

Geology and Physiography

The present geology and physiography of the project area is the culmination of millions of years of geologic, climatological, and ecological processes. This legacy has provided the template for current ecological conditions and has shaped and directed human uses of the varied terrains and resources within the project area.

Geologic Processes, Functions, and Patterns

At the regional scale (project area) and sub-regional scale (Ecological Reporting Units), geology, physiography, and topography are controlled by the past 1.5 billion years of plate tectonics, volcanoes, glaciers, and the resultant weathering, erosion, and sedimentation processes. It is the history and interaction of these processes that have resulted in present locations of mountain ranges, large river courses, watershed divides, and rock types exposed at the surface. These geologic and physiographic attributes exert considerable influence over climate, hydrology, and drainage pattern development. At the local scale (Sixth-field Hydrologic Unit Code or smaller), processes during the Pleistocene ice ages (last 1.6 million years) have been the influence on surface topography and soils. At the finest scale of channels and hillslopes, physiography is controlled primarily by recent (past 10,000 years) and present geomorphic processes and disturbances, such as floods, landslides, and volcanoes. The diversity of geologic environments, along with active tectonic, volcanic, and glacial processes, has been a controlling influence in the evolution and distribution of ecological systems, including patterns of human development and use.

The physiographic environment also dictates ecological potential and management options. For example, glaciated terrain commonly has steep slopes that are covered with soil and glacial sediments that are susceptible to erosion; areas near volcanoes commonly have thick, ash-rich soils that are highly productive but susceptible to compaction.

Erosion, sediment transport, and deposition are the geologic processes most relevant in day-to-day management of ecosystems in the project area. Moreover, these processes have been significantly affected by human activities. Detailed discussion of these processes are in the Aquatic Ecosystems section, because they are better viewed in the context of overall watershed processes.

Geology of UCRB Ecological Reporting Units

Geology of the entire project area is summarized in the Landscape Ecology Staff Area Report (1996), so only brief descriptions are provided here, by Ecological Reporting Unit (ERU).

Columbia Plateau (ERU 5)

Thick sequences of Tertiary basalt flows are locally covered by late-Tertiary and Quaternary sediment. During the ice-ages of the Pleistocene, the region was covered with windblown sediment, known as loess. Loess makes up the Palouse Hills and covers most of the upland surfaces. Rivers swollen with glacial meltwater and large Pleistocene floods inundated much of the Columbia Plateau, cutting into the basalt surfaces and forming the cliff-bounded valleys that contain the Columbia, lower Snake, and Deschutes rivers.

Blue Mountains (ERU 6)

The Blue Mountains are composed of a diverse suite of uplifted rocks, including Paleozoic, Mesozoic, and Tertiary sedimentary and igneous rock types. Higher mountains, such as the Seven Devils, Wallowa, and Elkhorn mountain ranges, were glaciated by alpine glaciers during the Pleistocene.

Northern Glaciated Mountains, Upper Clark Fork, and Lower Clark Fork (ERUs 7, 8, and 9)

The mountains across the northern part of the project area are underlain by a complex assemblage of Precambrian to Tertiary metamorphic, igneous, and sedimentary rocks. These rocks have been folded and faulted, resulting in broad, northwest trending ranges, commonly separated by wide downwarps such as the Okanogan, Spokane, Purcell, Bitterroot, Clark Fork, Kootenai, and Flathead Valleys. The Northern Glaciated Mountains ERU was extensively glaciated during the Pleistocene, resulting in unconsolidated glacial till covering many hillslopes, and thick fills and terraces of glacial outwash in the river valleys. Higher ranges in the Upper Clark Fork and Lower Clark Fork ERUs had Pleistocene alpine glaciers. Glacially dammed Pleistocene Lake Missoula inundated valleys of the Lower Clark Fork and Upper Clark Fork ERUs to an elevation of 4,600 feet, resulting in accumulations of fine-grained and unconsolidated lake sediment in many valley bottoms.

Owyhee Uplands (ERU 10)

The Owyhee Uplands ERU is composed of two distinct physiographic provinces—the western Snake River Plain and the Owyhee Uplands. The western Snake River Plain is a structural depression that has been filled with horizontal sheets of Tertiary basaltic lava flows that are interbedded with river and lake sediment.

Except for the canyon of the Snake River, there is little relief on the surface except for small shield volcanoes, volcanic buttes, and lava flows. The surface is mantled by loess and alluvial sand and gravel derived from surrounding mountains. Southwest of the Snake River, the Owyhee Uplands is a partly dissected and folded plateau, underlain by Tertiary volcanic rocks, and mantled by alluvial silt, sand, and gravel.

Upper Snake (ERU 11)

The Upper Snake ERU is part of the eastern Snake River Plain geologic province. The eastern Snake River Plain is a wide, featureless surface underlain by Tertiary and Quaternary basaltic and silicic volcanic rocks. The Snake River has locally cut a deep canyon along the south margin of the plain; locally flanking the river are Pleistocene gravel terraces composed of outwash from the Yellowstone Ice Cap and flooding from Pleistocene Lake Bonneville. The basalt upland surfaces are locally covered by several meters of loess. The southwest portion of the ERU consists of north-to-south trending mountain ranges separated by alluvial valleys.

Snake Headwaters (ERU 12)

The Snake Headwaters ERU contains north-to-south trending mountain ranges primarily composed of Paleozoic and Mesozoic sedimentary rocks that have been folded and faulted. The higher ranges were glaciated during the Pleistocene by alpine glaciers and the YellowstoneIce Cap.

Central Idaho Mountains (ERU 13)

The eastern portion of the Idaho Batholith is primarily underlain by Mesozoic and Tertiary granitic and volcanic rocks that have been uplifted and dissected to form locally steep alpine ridges and breaklands. Steep topography with narrow valley bottoms discouraged roading and consequent human development. Higher mountains within the batholith were extensively glaciated by Pleistocene alpine glaciers, resulting in valleys and basins being filled with alluvium and outwash. Extensive physical and chemical weathering of the granitic rocks has resulted in a thick mantle of regolith that is readily eroded if the vegetation and soil cover is disturbed. The southeast portion of the Idaho Batholith ERU includes areas underlain by a greater variety of rock types, including Tertiary volcanic rocks and Precambrian and Paleozoic metamorphic rocks. The physiography is dominated by northwest-trending basin-and-range mountains of the Lost River, Beaverhead, and Lehmi Ranges, separated by alluviated valleys and basins.

Soils and Soil Productivity

Summary of Conditions and Trends

- Soil productivity across the project area is generally stable to declining. Determination of the exact status of soil condition for any given area is difficult because of lack of inventory and monitoring data. Generally, greater declines in soil quality and productivity are associated with greater intensities of vegetation management, roading, and grazing.
- Soil organic matter and coarse wood (woody material greater than three inches) have been lost or have decreased as a result of displacement and removal of soils and removal of whole trees and branches.
- There has been a loss of soil material from direct displacement of soils, as well as from surface and mass erosion. Erosion can result from changed water runoff patterns from increased bare soils exposure, compaction, and concentration of water from roads.
- Changes in the physical properties of soils have occurred in conjunction with activities that increase bulk density through compaction. These changes have largely resulted in impaired soil process and function, such as decreased porosity and infiltration and increased surface erosion.
- Sustainability of soil ecosystem function and process is at risk in areas where redistribution of nutrients in terrestrial ecosystems has resulted from changes in vegetation composition and pattern, removal of the larger size component of wood, and risk of uncharacteristic fire.
- Floodplain and riparian area soils have reduced ability to store and regulate chemicals and water, in areas where riparian vegetation has been reduced or removed or where soil loss associated with roading in riparian areas has occurred. In these areas,

water quantity may be reduced during low flows, and water quality may have less buffer from pollution.

Soils form an ecologically rich and active zone at the interface between geologic materials and the atmosphere. The soil that occurs at a particular site depends on the geologic parent material, climate, relief, and organisms occurring at that site, and on the amount of time that has been available for these five soil-forming factors to interact. Soil-forming and soil-recovery processes can be slow; therefore, disruption of soils can lead to long-term changes in ecological conditions, including biological and hydrologic processes. Much of the following material is summarized from the Landscape Ecology Staff Area Report (1996), Harvey et al. (1994), and Henjum et al. (1994).

Soil Processes, Functions, and Patterns

Soil is the primary medium for regulating movement and storage of energy and water and for regulating cycles and availability of plant nutrients (Meurisse et al. 1990). The physical, chemical, and biological properties of soils regulate biological productivity, hydrologic response, site stability, and ecosystem resiliency. Soils anchor vegetation and contain mineral nutrients and water required for plant growth. Soils also contain a vast variety of microorganisms that promote decomposition of organic material, such as leaves, twigs, and large wood. This decomposition process is a critical link in the nutrient cycling process, especially for plant nutrients such as carbon, nitrogen, potassium, phosphorous, and sulfur (see sidebars on Carbon Cycle in the Forestlands section of this chapter and on Nitrogen Cycle in the Rangelands section). The diverse geology and climate of the planning area, in conjunction with natural and human disturbance, have resulted in a spatially complex pattern of soils that differ in appearance, function, and response to management activities.

Soil Horizons

Most soils in the ICBEMP project area have formed since the last ice age and are composed of several horizons, or layers. These horizons have differing capacities for supplying nutrients and holding water, so soil productivity is not directly proportional to soil depth. Because the highest concentration of nutrients and biota are in the uppermost soil horizons, incremental removals of soil (such as by soil erosion) nearer the surface are more damaging than those of subsoils (Swanson et al. 1989). At the surface, there is commonly a thin (generally less than two inches), and sometimes discontinuous cover of decaying organic matter, such as leaves and twigs. Under this cover of litter and duff is a layer (less than a few inches) of dark, highly decomposed organic matter (humus) which covers a mineral layer of up to several feet thick. This mineral layer may contain organic matter, clay minerals, calcium carbonate, and other salts that are transported down the soil column by percolation or burrowing activities. In general, forested environments have more continuous and thicker organic matter layers consisting of litter and duff material above the mineral soil compared to rangeland soil horizons, but the thickness and amount of organic material varies considerably depending on local vegetation characteristics, climate, relief, and disturbance history (including human uses and fire). These soil horizons together cover weathered and unweathered parent materials, such as bedrock or old stream gravel. Volcanic material is a major component of many soils.

Physical Properties

Physical properties of soils, such as bulk density (dry weight per unit volume), porosity, texture, hydrologic conductivity, soil depth, and mineral content, are all factors controlling hydrologic response, water-holding capacity, and surface stability. Soil water-holding capacity is a critical factor in the project area, where growing season precipitation is low. Soils with high organic matter contents generally have high porosities and high water-storage capacities.

The physical properties of soils can be altered by disturbances such as erosion and compaction. Soil compaction results from concentrated activity, including use of heavy equipment, vehicles, pedestrian activity, and improper livestock grazing. Where soils are compacted, porosity, permeability, and hydrologic conductivity are reduced, resulting in altered runoff patterns and increased surface erosion. Natural recovery of surface compaction can take 50 to 80 years, depending on the soil type, degree of compaction, frequency of freeze-thaw cycles, and input of organic matter. Recovery of compacted subsoils usually requires upward of 200 years.

Biological Properties

Soil biological properties also profoundly affect productivity. Soil is a reservoir of fungal spores and other organisms important for decomposition and nutrient cycling. These organisms and their interactions profoundly affect forest site productivity through assimilation of nutrients, protection against pathogens, maintenance of soil structure, and buffering against moisture stress (Amaranthus and Trappe 1993). The number of species of microorganisms in the soil is far greater than above-ground plants and animals, and research has shown a critical linkage between soil microorganisms and processes and forest productivity (Molina and Amaranthus 1990). Soil moisture and temperature regimes strongly influence forest type, distribution, and soil productivity. Erosion or removal of soil surface layers, where most microorganisms reside and where most of the critical nutrient cycling processes occur, can significantly affect productivity for several decades.

Organic Matter

Organic matter, both above and below ground, is an important component for maintaining soil productivity. In general, the higher the total soil organic matter, the higher the site productivity. After carbon and oxygen, nitrogen is the element required in greatest quantity by trees and other kinds of vegetation, and nitrogen is known to be limiting in many forest and rangeland soils in the inland West. Accumulated litter and woody debris is potential fuel for wildfire, an important factor controlling soil conditions in forestlands and rangelands of the planning area, especially in drier environments where fire frequency is high (Harvey et al. 1994). The combined processes of biological decomposition and fire regulate nutrient availability and cycling.

Fire

Fire can substantially change surface soil characteristics and erosion rates, and can influence patterns of vegetation on the landscape. These patterns depend in large part on availability of soil organisms and relationships, such as mycorrhizae, to post-fire vegetation. Fire can have consequences on soil productivity by consuming organic matter and vegetation. Nutrients, such as nitrogen, can be evaporated by fire, resulting in an immediate loss of soil productivity as well as limiting future inputs of nutrients. However, nutrients are also made available by fire, especially by converting large woody debris into smaller, more readily decomposed material (DeBano 1990). Forests in the inland west, including the project area, depend on a combination of biological and fire decomposition processes to regulate nutrient availability and cycling (Harvey 1994).

Fire can also affect soil productivity by creating bare soil or hydrophobic (water-repelling) conditions that alter infiltration, runoff, and erosion processes. In general, the more soil heating that occurs, the greater the potential for water repellency. The formation of hydrophobic conditions is not completely understood; it occurs in both burned and unburned soils. In Central Idaho, fires from 1992 and 1994 likely made hydrophobic soil conditions worse, especially where high soil heating occurred. Dry, coarse textured soils are most susceptible to becoming water-repellent, especially after high intensity fires.

Current Conditions

Detailed soil productivity information was not available for the interior Columbia Basin. For this reason, an expert panel and soil productivity indicators were used to estimate conditions and trends across the basin. The following information is from the Regional and Subregional Soil Productivity Assessment (part IV.B of Landscape Ecology STAR 1996) produced by the expert panel. The indicators used by the expert panel were: organic matter level, coarse woody material, nitrogen, bulk density, and susceptibility to soil loss.

General Trends

Soil productivity trends across the interior Columbia Basin are judged to be stable to decreasing. Determination of the exact status of soil condition for any given area is difficult because of the lack of inventory and monitoring data. In general, greater declines in soil quality and productivity are directly associated with greater loss of soil from erosion and displacement, loss of soil organic matter, changes in vegetation composition, removal of whole trees and branches, and increased bulk density from compaction. Areas where fire has not occurred in frequencies characteristic for the site, and which otherwise have not had organic matter and

vegetation removal, may have higher soil productivity currently. However, these areas are vulnerable to loss of organic matter, woody material, and nutrient reservoirs from risk of uncharacteristic fire.

General Soil Characteristics and Productivity, by ERU

Listed below are general soil characteristics and productivity summary for the UCRB planning area, by ERU. The characteristics are summarized from Bailey et al. (1984) and the General Soils Map of Oregon (USDA 1964). Each ERU contains a complex pattern of many soils, but in the general summary of soil productivity that follows, the productivity assessment is generalized for these large areas. Each ERU contains inclusions of soils that are more or less productive, erodible, or stable than the general ratings given for the entire area.

Columbia Plateau (ERU 5)

Soils in the Columbia Basin and Palouse area have primarily formed in thick accumulations of silt and sand (loess) deposited by ice-age winds. These are generally deep productive soils. They tend to be warm and dry, with thin, dark organic horizons (layers) over clay and carbonate-enriched lower horizons. These soils occur on rolling hills, and when exposed are susceptible to wind and water erosion.

Blue Mountains (ERU 6)

Most soils in the Blue Mountains are influenced by volcanic ash from Mount Mazama. The most productive soils have thick volcanic ash surface layers and occur at mid-elevations. On south-facing slopes, the ash has been mostly removed by crosion, and redeposited and mixed with loess and alluvium in valley bottoms and lake basins. At high elevations, soils are generally cold and moist, dark-colored, and have high organic-matter contents. Soils derived from glacial materials at high elevations have moderate to low productivity, being limited by nutrients and cold temperatures. At lower elevations, soils are generally cool and moist, with thick ash mantles and high clay contents. Soils at low elevations and on south slopes with minimal volcanic ash have moderate to low productivity. On the lowest mountain slopes and valley floors, soils are dry for parts or most of the summer.

Northern Glaciated Mountains (ERU 7)

Soil conditions range from cold and stony in the higher mountains to warm and dry within the major valleys. Farther east, away from the Cascade Range, the volcanic ash content is less and soils are generally less productive. Steep slopes covered with glacial deposits are susceptible to compaction and erosion.

Lower Clark Fork (ERU 8)

Soils in the Lower Clark Fork ERU generally have high volcanic ash contents, and moderate temperature and moisture regimes, resulting in generally high productivity. Many of these soils are deep and highly weathered, which also adds to their productivity. Soils are generally resilient but susceptible to compaction. Natural mass failure and natural surface erosion hazards are moderate to high.

Upper Clark Fork (ERU 9)

Soils in the Upper Clark Fork ERU are generally cold, shallow, and rocky, resulting in overall low productivity. An exception is the Bitteroot Valley, where soils are deep and productive. The limiting factors for productivity are shallow soils, large amounts of talus and rock outcrops, and low temperatures. Soils are generally less resilient and less susceptible to compaction. Natural mass failure hazard is moderate, while natural surface erosion hazard is moderate to high.

Owyhee Uplands and Upper Snake (ERUs 10 and 11)

Soils in the Owhyee Uplands and Upper Snake ERUs are generally warm and dry, with moisture being a limiting factor to plant growth. In wetter riparian and wetland areas, organic matter content is higher and soil productivity is greater than the uplands. Of the uplands, higher elevation areas are usually more productive. Soils are generally resilient but susceptible to compaction. Soils on the Snake River Plain are generally warm, dry, and shallow, with zones of substantial clay and carbonate accumulation. Some areas of low precipiation have saline or sodic soils.

Snake Headwaters (ERU 12)

The Snake River Headwaters ERU includes some of the highest elevations in the interior Columbia Basin, extending up to 13,766 feet. Soil productivity is generally moderate. Many soils

are cold, shallow to moderately deep, rocky, or stony. Where alpine areas occur they consist mostly of rock outcrop and talus. Glaciation has also produced many areas of shallow soils and rock outcrops. In stream and river valleys, soils are deeper, contain more organic matter, and have higher productivity. Soil moisture can be limiting in some areas. The soils are moderately resilient and have low to moderate susceptibility to compaction. Natural mass failure hazard is moderate to high. Interbedded sedimentary bedrock weathers to form slip surfaces. Slope stability problems are common and natural surface erosion hazard is moderate to high.

Central Idaho Mountains (ERU 13)

In the northern and western portion of this ERU, soil productivity is generally moderate. Areas having shallow soils with coarse textures and low organic matter are less productive. Areas having deep soils and/or volcanic ash accumulations are usually very productive, and are moderately resilient and moderately susceptible to compaction. Natural mass failure rating is high, while natural surface erosion hazard is moderate.

In the south central part of this ERU, soil productivity is generally moderate to low. This area includes some of the higher elevations in the interior Columbia Basin, extending up to 12,000 feet. Many soils are cold, shallow to moderately deep, rocky, and stony. Where alpine areas occur, they consist mostly of rock outcrop and talus. Glaciation has also produced many areas of shallow soils and rock outcrop. Some areas receive as little as seven inches of precipitation annually, so soil moisture is limiting in these areas. The soils have low to moderate resiliency and are moderate to highly susceptible to compaction. Natural mass failure hazard is moderate to high. Mass failures and rock falls are common at higher elevations. Natural surface erosion hazard is moderate to high.

In the eastern portion of this ERU, soil productivity is generally low. Some valley areas with deeper soils have moderate to high productivity. These soils generally have low resiliency and are moderately susceptible to compaction. Natural mass failure hazard is low, while natural surface erosion hazard is moderate to high.

Climate

The varied topography and geographic position, relative to global ocean and atmospheric circulation patterns, result in very different climates throughout the ICBEMP project area. The climate, in turn, strongly influences ecological processes such as biological productivity, fire regime, soils, streamflow, erosion, and human uses of the land and resources.

Precipitation and Temperature

Most precipitation in the project area falls in the winter when eastward moving storms enter the area. Typically, more than 80 percent of the annual precipitation falls from October to May. Expansion of the North Pacific high pressure system in the early summer effectively blocks the flow of moisture into the Pacific Northwest, resulting in generally stable, warm, and dry summers. The Cascade Range separates eastern Oregon and Washington from the maritime climate west of it, leaving the interior Columbia River Basin with a continental climate of cold winters and warm, dry summers. Map 2-1 shows the annual precipitation patterns for the project area.

Average annual precipitation values range from more than 100 inches per year at the crest of the Cascade Range to less than 8 inches per year in the low-elevation basins and plains. Substantial portions of the planning area, especially rangelands, receive less than 12 inches of precipitation per year. In these areas, recovery of vegetation and soil from human and natural disturbance takes place much more slowly than in areas with greater rainfall. The greatest amount of precipitation is in the mountain ranges, notably the Blue Mountains, the central Idaho Mountains, and the Northern Rocky Mountains across the northern part of the project area. Most precipitation falls during winter and accumulates as snow, with mean annual snowfall of 100 to 200 inches along the crest of the Cascade Range and in the Blue Mountains. Spring, summer, and fall storms provide growing season rainfall in the mountains, especially in the eastern part of the project area.

The project area experiences a wide range of temperature variation. High mountainous areas have cold winters and short, cool summers with growing seasons that are locally less than 30 days in the highest alpine areas. Intermontane valleys and plateaus have cool to cold winters and hot

summers, resulting in growing seasons that exceed 150 to 200 days in parts of the Columbia Plateau (ERU 5).

Drought

Drought is an important process that affects ecosystems. Drought is defined as an absence of usual precipitation (less than 75 percent of normal), for a long enough period that there is decreased soil moisture and stream flow, thereby affecting ecological processes and human activities. All regions experience temporary, irregularly recurring drought conditions, but dry climates are generally affected most (Barry and Chorley 1982). Year-to-year climate variability generally increases with aridity. In areas with average annual precipitation of less than 12 inches, drought years occur 20 to 40 percent of the time (Landscape Ecology STAR 1996).

Drought affects fire and rangeland management. Dry years, such as 1988 and 1994, commonly result in widespread wildfire in forested environments, especially if there have been several preceding dry years. Drought reduces forage production on rangelands, which can lead to degradation of upland and riparian areas if livestock grazing is not properly managed (Vallentine 1990). Drought can also increase the susceptibility of forestlands to insect infestation. The regional drought of 1920 to 1940 in the Pacific Northwest created substantial insect infestation problems, particularly for pine species (Agee 1993).

Climate Change

Climate change is also an important process affecting ecosystems. Climate change has been prevalent throughout history in the project area, resulting in continuing adjustments by aquatic and terrestrial ecosystems. Changes in temperature and precipitation have direct effects, such as effects on the efficiency of photosynthesis and length of growing season; they also have important indirect effects, such as alterations in fire and flood frequency. Past climate change in the project area has ranged from global-scale changes (such as the transition between glacial and interglacial periods approximately 10,000 years ago, which resulted in about a ten degree Fahrenheit increase in mean annual temperature) to smaller yet still important changes, (such as the period of generally cooler temperatures that began approximately 4,000 years ago and culminated in the Little Ice Age of the 1700s and early 1800s). Over the past several decades in the Pacific Northwest and globally, there has been significant warming (one to three degrees Fahrenheit) that some scientists have attributed to increased carbon dioxide emissions and the "greenhouse effect."

Vegetation is especially sensitive to climate change. Upper and lower forest boundaries in the project area have moved up and down in elevation by hundreds of feet during the past several centuries in response to temperature changes of one to three degrees Fahrenheit (Mehringer 1995; Neitzel et al. 1991). In general, plants on the fringes of their distributions respond most sensitively and rapidly to climate change. Within the project area, such changes are expected to continue to greatly influence the area and extent of vegetation types, especially changes in elevation of the overlapping conifer and steppe communities (Mehringer 1995). Vegetation responds to climate change in different directions and at different rates, reassembling in new and sometimes unpredictable associations that are constantly changing (Graham and Grimm 1990).

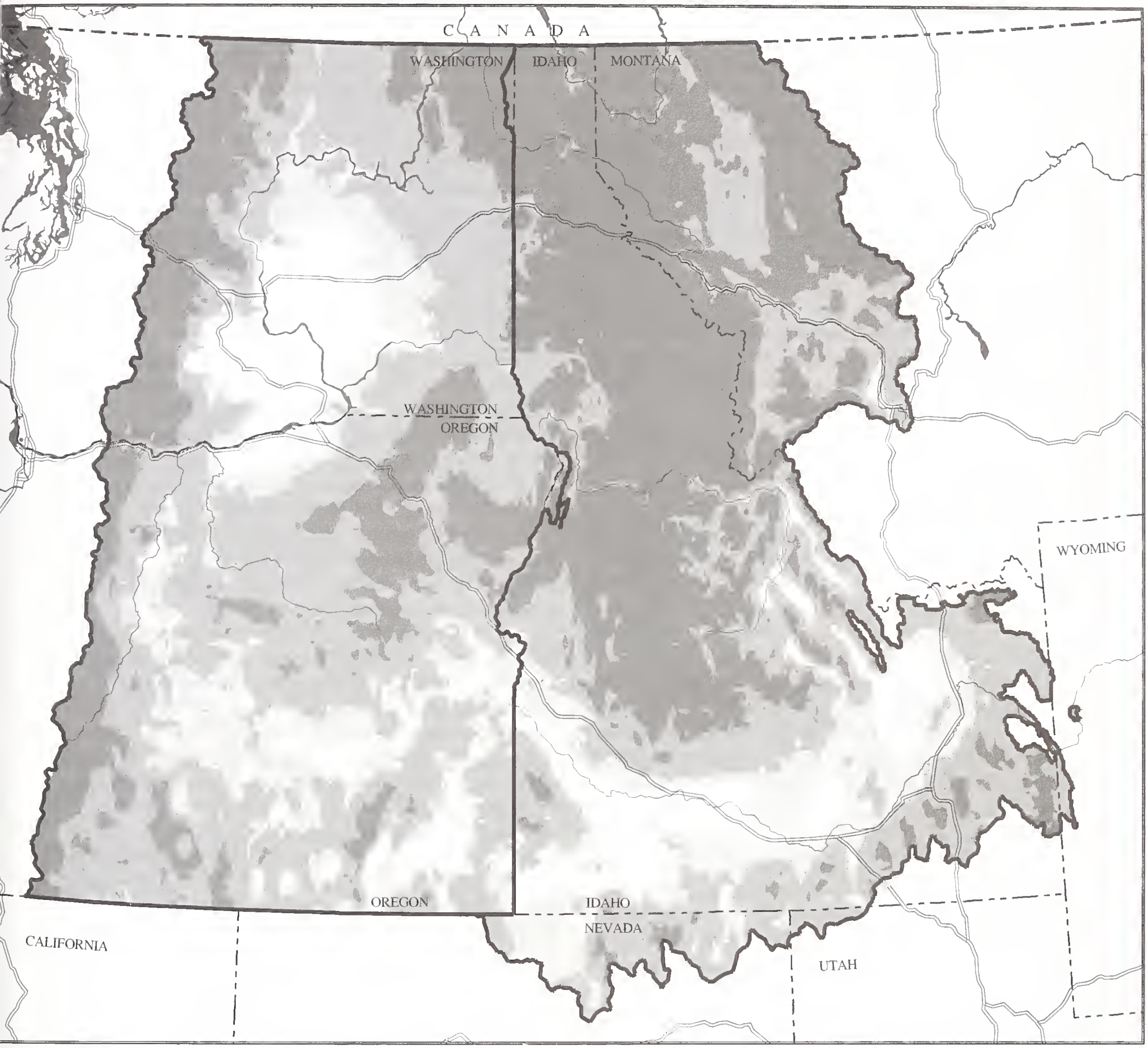
Air Quality

Summary of Conditions and Trends

- ◆The current condition of air quality in the project area is considered good, relative to other areas of the country.
- ◆Wildfires significantly affect the air resource. Current wildfires produce higher levels of smoke emissions than historically, because fuel available to be consumed by wildfire has increased.
- ◆Within the project area, the current trend in prescribed fire use is expected to result in an increase of smoke emissions.

Historical Conditions

Air quality in the project area was not pristine before it was settled by Europeans in the 1800s, particularly with regard to smoke. Layers of charcoal found in the Sheep Mountain bog near



Map 2-1.
Annual Precipitation

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
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Missoula, Montana and the Williams Lake Fen north of Cheney, Washington provide evidence of wildland fire at varying intervals from 10,000 years ago to the present (Johnson et al. 1994). Fires from as long as 4,000 years ago are evident from charcoal found at Blue Lake, near Lewiston, Idaho. Several sites show significantly increased levels of charcoal starting about 1,000 years before present, attributed to burning by American Indians.

Many historical accounts refer to the presence of smoke and burned areas in the interior Columbia Basin, the Harney Basin, near the mouth of the Umatilla River, on the western slope of the Blue Mountains, and along the section of the Oregon Trail from the juncture of the Boise and Snake Rivers to the Columbia River (Robbins and Wolf 1994). Some accounts merely noted the presence of burned areas, while others attributed fire to burning by American Indians (ibid.). Levels of smoke declined as fire was excluded from forests, particularly after the advent of organized fire suppression in the 1930s. Brown and Bradshaw (1994) concluded that levels of smoke in the Bitterroot Valley, Montana were 1.3 times greater prior to settlement in the 1800s than they have been recently. Agee (1993) documents that fire has played a role as a disturbance agent in the development of Pacific Northwest ecosystems.

Current Conditions

Elements related to the Clean Air Act

The Clean Air Act, passed in 1963 by the Congress and amended several times, is the primary legal instrument for air resource management. The Clean Air Act requires the Environmental Protection Agency (EPA) to, among other things, identify and publish a list of common air pollutants that could endanger public health or welfare. These commonly encountered pollutants, referred to as "criteria pollutants," are listed by the EPA along with the results of studies documenting the health effects of various concentrations of each pollutant. For each criteria pollutant, the EPA has designated a concentration level above which the pollutant would endanger public health or welfare. These levels are called the National Ambient Air Quality Standards (NAAQSs).

To date, NAAQSs have been established for six criteria pollutants: sulfur dioxide ($S0_2$), particulate matter (PM_{10}), carbon monoxide (CO), ozone (O_3), nitrogen oxides (No_x), and lead (Pb). There are exceptions, but generally these standards are not to be violated anywhere the public has free access within the United States. If NAAQSs are violated in an area, the area is designated as a "non-attainment area," and the State is required to develop an implementation plan to bring it back into compliance with these standards. To help protect air quality, the Clean Air Act (Section 118) requires Federal agencies to comply with all Federal, State, and local air pollution requirements.

Pollutants such as oxides of nitrogen and sulfur are of concern to Federal land managers because of their potential to cause adverse effects on plant life, water quality, and visibility. However, the sources of these pollutants are generally associated with urbanization and industrialization rather than with natural resource management activities. Therefore, these pollutants will not be considered further in this EIS. On the other hand, particulates, carbon monoxide, and ozone are criteria pollutants that can be created by fire; these pollutants are discussed below. The pollutant of greatest concern for management activities in the UCRB planning area is particulate matter (PM).

Three elements of the Clean Air Act generally apply to management activites that produce emissions in the UCRB planning area: (1) Protection of National Ambient Air Quality Standards (NAAQSs) (Section 109); (2) Conformity with State Implementation Plans (Section 176(c)); and (3) Protection of Visibility in Class I Areas (Section 169A).

Protection of National Ambient Air Quality Standards (NAAQSs).

Particulate matter can be produced by land management activities or natural events on federally-administered lands, including wildfire, prescribed burning, road or wind blown dust, volcanic eruptions, and vehicle use. However, most particulate matter of concern is produced from fire, and most of this is *less* than 10 micrometers (PM_{10}) in diameter, which is the size class that is regulated.

Because fire and smoke are a natural part of forestland and rangeland ecosystems, PM_{10} produced from fire does not seriously affect these ecosystems. However, they do have effects on human health. PM_{10} particles can be drawn deep into the aveolor region of the lungs, the part of the respiratory

system most sensitive to chemical injury (Morgan 1989 in Sandberg and Dost 1990). Wood smoke also contains carcinogenic compounds.

Ozone is a photochemical pollutant formed on warm sunny days from nitrogen dioxide and hydrocarbon emissions. The chemistry of ozone formation is poorly understood; however, it is known that ozone is present in the plume downwind of large fires. It is also known, but difficult to quantify, that organic emissions from vegetation capture ozone – so forested areas are both sources and sinks of ozone. Although ozone is produced as a byproduct of wildland fire, because of fire frequency and plume elevation it is generally not a significant problem for human health or vegetation resources. It is also significant to note that fire is a natural event within forestland and rangeland areas. Therefore, to some extent, ozone produced by fire is also a natural event, and these ecosystems have some natural adaptation to its effects.

Carbon monoxide is generated mainly by incomplete combustion of carbon. There have been few, if any, measured effects to the ecosystem from carbon monoxide. It is generated during wildland burning but is rapidly diluted at short distances from a fire and, therefore, poses little or no risk to community health (Sandberg and Dost 1990). However, carbon monoxide can be a health concern for firefighters on the fireline depending on concentration, duration, and level of activity. (USDA Forest Service and John Hopkins University 1989).

Many *other* non-criteria, but potentially toxic, pollutants are emitted by wildland fire, including polynuclear aromatic hydrocarbons (sometimes referred to as PAHs) and aldehydes. Effects on human health vary by levels of exposure to these pollutants emitted during combustion. Some polynuclear aromatic hydrocarbons are known to be potential carcinogens; other components, such as aldehydes, are acute irritants. Many of these air toxics dissipate or bind with other chemicals soon after release, making it difficult to estimate human exposure and consequential health effects. Additionally, the health and welfare effects of air toxics released by prescribed burning or wildfires have not been directly studied.

Conformity with State Implementation Plans

The Clean Air Act requires each State to develop, adopt, and implement a State Implementation Plan to ensure that the NAAQSs are attained and maintained for the criteria pollutants. These plans must contain schedules for developing and implementing air quality programs and regulations. State Implementation Plans also contain additional regulations for areas that have violated one or more of the NAAQSs (non-attainment areas).

The general conformity provisions of the Clean Air Act (Section 176(c)), prohibit Federal agencies from taking any action *within a non-attainment area* that causes or contributes to a new violation of the NAAQSs, increases the frequency or severity of an existing violation, or delays the timely attainment of a standard. Federal agencies are required to ensure that their actions conform to applicable State Implementation Plans. The Environmental Protection Agency (EPA) developed and finalized criteria and procedures for demonstrating and ensuring conformity of Federal actions to State Implementation Plans. However, as written, they apply only to Federal actions that occur within non-attainment areas.

As of the printing of this EIS, none of the National Forests or BLM Districts in the UCRB planning area lie within non-attainment areas. Therefore, requirements of the conformity regulations do not apply to management actions proposed in this EIS. However, Federal actions must still comply with State Implementation Plans.

Protection of Visibility in Class I Areas

Congress, in the Clean Air Act, declared as a national goal "the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory Class I Federal areas which impairment results from manmade air pollution". Class I areas in the project area are Wildernesses 5,000 acres in size or National Parks 6,000 acres in size which were in existence prior to 1977. Map 2-2 shows the Federal Class I areas in the project area.

Class I areas are subject to the most limiting restrictions regarding how much additional pollution can be added to the air. Fine particulate matter, generally less than 2.5 microns in diameter (PM 2.5), is the primary cause of visibility impairment. Emissions from prescribed burning, which stay suspended for many miles, are in the 0.1 to 2.5 micron size class and generally reduce visibility.

Results of a 1990 National Park Service study of visibility in National Parks and Wildernesses in the Washington Cascade Range (Malm et al. 1994) indicated that organics (vegetation burning activity)

contributed approximately 17 percent of the impairment, with 53 percent from sulfates, 9 percent from nitrates, and 20 percent from soil and other causes. These parks are on the western edge of the project area, but information on particle composition and source regions is relevant to the project area because these fine particles are transported over long distances. It is logical to expect that emissions from land management activities would account for a larger proportion of particulates in the UCRB planning area because of lower industrial and urban emissions compared to the Puget Sound emissions that affected the Park Service study area.

Managing Emissions From Prescribed Fire

Under the Clean Air Act, State and local governments have the authority to adopt their own air quality rules and regulations. These rules are incorporated into their State Implementation Plans if they are equal to, or more protective than, Federal requirements. For example, some States have incorporated smoke management provisions for prescribed burning into their State Implementation Plans. As stated earlier, to help protect air quality, the Clean Air Act requires Federal agencies to comply with all Federal, State, and local air pollution requirements, which include State-enacted visibility protection and smoke management programs. Montana has officially adopted smoke management programs into its State Implementation Plans. In Utah and parts of Idaho, memoranda of understanding have been signed by the States and Federal land managers that establish parameters for managing emissions from prescribed burning.

Tracking Emissions

An emissions information system is used in Oregon, Washington, Montana, and northern Idaho to quantify prescribed fire emissions and to track changes in emission productions within their jurisdictions. Federal land managers have an obligation to complete smoke management reports and apply appropriate mitigation measures to reduce potential impacts on air quality (EPA 1992). Managers use, although they are not limited too, available computer software to estimate fuel consumption, emissions, and smoke dispersion from prescribed burns.

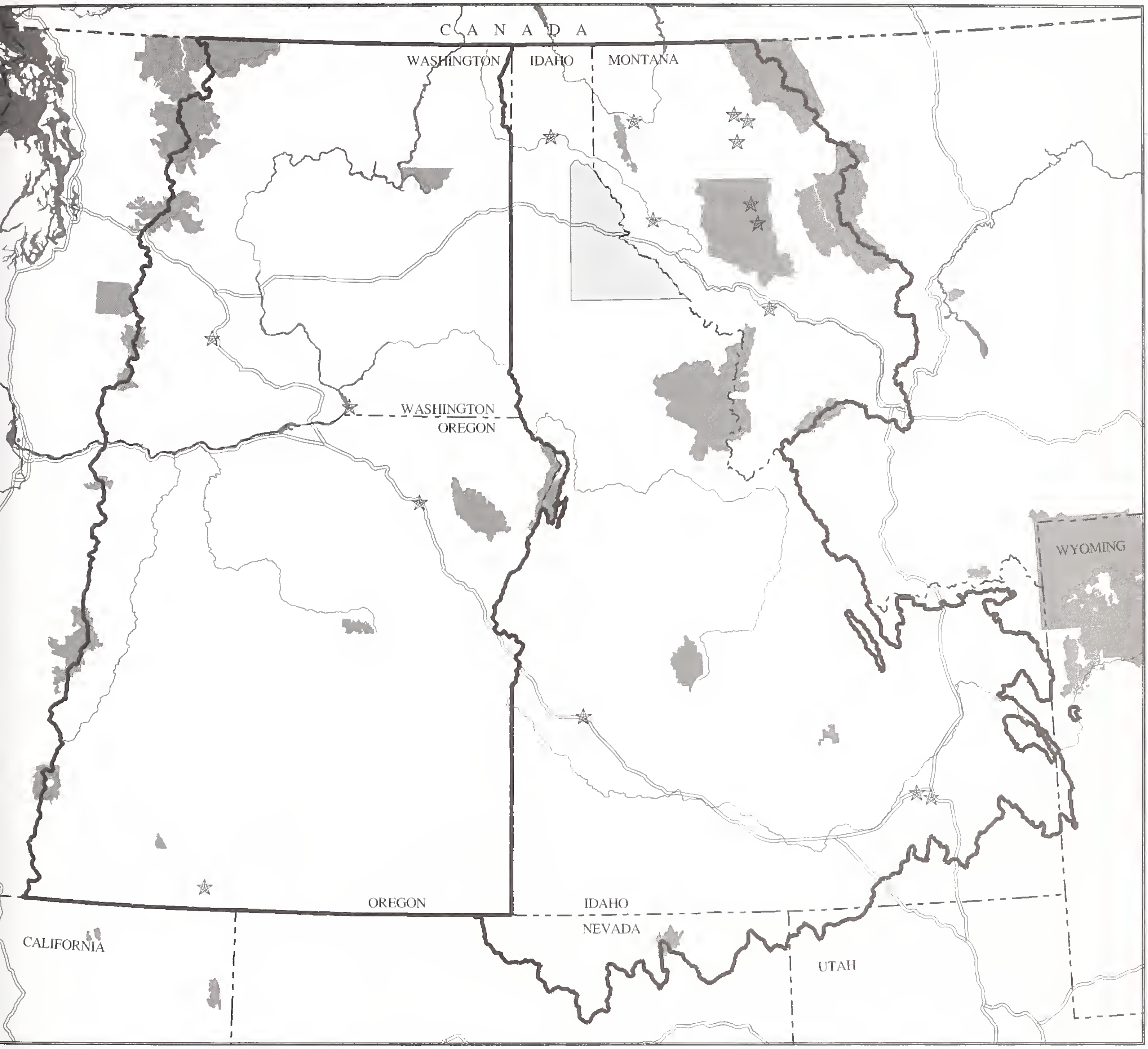
Monitoring Air Quality

Several different monitoring networks currently measure air quality in the planning area. The most extensive of these are the State and Local Air Monitoring Stations/National Air Monitoring Stations. Operated by the States, this monitoring network is used to determine whether the National Ambient Air Quality Standards are met. Monitors in this network are concentrated in population centers.

Federal agencies are also operating monitors at five sites within or near the UCRB planning area. These monitoring sites measure particulates and changes in visibility, using filters that can be analyzed to determine the relative contribution of different sources of particulate matter. In addition to monitoring pollutant concentrations, State and Federal agencies collect, and archive, the following type of data about prescribed fires: location, acres burned, moisture content of fuels, tons to be consumed, and emissions to be released.

Air Quality Tradeoffs Between Prescribed Fire and Wildfire Emissions

Wildfires currently have a significant impact on the air resource, degrading ambient air quality and impairing visibility. The wildfire regime is significantly different than it was historically, because of increased fuel loading, development of ladder fuels, and increases in stand density. Only about 10 percent of acres burn with nonlethal underburns, compared to about 31 percent historically. Fifty-eight percent of the forest in the UCRB now burns with a lethal (stand-replacing) fire regime, compared to 19 percent historically. Stand-replacing fires consume much more fuel and produce much more smoke than nonlethal fires, which usually burn with fairly low surface fire intensities in the understory. Brown and Bradshaw (1994) found that emissions were greater from current fires, even though they burned fewer acres in total than historically, because consumption of fuel per unit area burned has been greater in the current period. Figure 2-3 illustrates fire regime patterns. Table 2-1 compares historical and current fire regimes.



Map 2-2.
Air Quality
Class I Airsheds and PM10 Non-attainment Areas

50 0 50 100 150 miles

50 0 50 100 150 km

N

Class One Airsheds

PM10 Non-Attainment Areas (Counties)

PM10 Non-Attainment Areas (Municipalities)

Major Rivers

Major Roads

EIS Area Border

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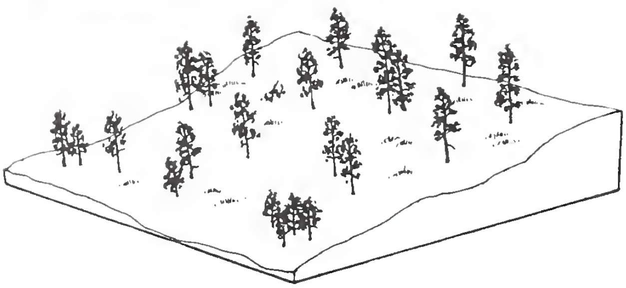
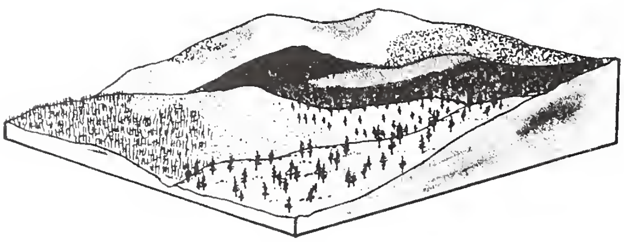


A. Non lethal Fire Regime
Open stand pattern.
Frequent low-severity fires.

B. Mixed Fire Regime
Patches of clumps/gaps.
Generally a greater time span between fires than the non-lethal fire regime.



C. Lethal Fire Regime
Large patches of stand-removing fire. Generally a longer time span between fires than the non lethal fire regime.

Figure 2-3. Fire Regimes/Patterns ~ Three general fire regimes create definite landscape vegetation patterns.

Table 2-1. Comparison of Historical and Current Fire Regimes in Forested Areas, in Percent of Area with Each Regime Type, for FS-BLM Lands, UCRB Planning Area

Fire Regime Type	Historical %	Current %
Nonlethal	30.9	10.5
Mixed Severity	50.1	31.3
Lethal, Stand-replacing	19.0	58.2

Source: ICBEMP GIS Data (1KM^2 raster data)

Prescribed fires are used to reduce the amount of carrier fuels and ladder fuels, and thus reduce the potential for lethal, stand-replacing fire. They are ignited under fuel moisture conditions that reduce total fuel consumption (see table 2-2). Prescribed fires are implemented when mixing height and winds are most favorable for smoke dispersal of emissions away from populated areas; they are not conducted during inversions. Inversions during the summer are a major cause of the worst ambient air conditions associated with wildfires in the project area.

While increased levels of prescribed fire can have temporary negative impacts on air quality, acute impacts to air quality from wildfires can be reduced in the long term (Schaaf 1996). Over the past ten years, State air regulators and scientists have measured concentractions of PM_{10} in the long term that came from wildfires, in urban areas well over the NAAQSs, finding that these episodes commonly last several days. For example, the 1994 wildfires around Wenatchee, Washington, produced 24-hour concentrations of PM_{10} that were more than double the Federal health standard, and conditions persisted for days. Impacts to populated areas from prescribed fire emissions can be more frequent, but the level of impact is well below established health standards for PM_{10} (Scire and Tino 1996).

Photo 1. Smoke emissions from fires can stay suspended in the air for many miles, potentially affecting air quality. Photo by Karen Wattenmaker.

Table 2-2. Smoke Emissions Produced by Wildfires and Prescribed Fires.

		Smoke Emissions PM_{10}		
Potential Vegetation	**Fuel Loading**	**Wildfires Dry Fuels**	**Prescribed Fires Moist Fuels**	**Prescribed Fires Average Fuels**
Cold Forest	29.5	514.4	303.2	385.2
Cool Shrub	6.5	118.7	74.6	84.6
Dry Forest	27	464.4	267.4	345
Dry Grass	2.9	62.4	27.6	34.2
Dry Shrub	6.4	136.9	86.8	97.2
Moist Forest	34.8	607.0	358.8	452.5
Woodland	9.6	175.4	120.7	139.6

Source: Ottmar et al. 1996

Terrestrial Ecosystems

Key Terms Used in This Section (Introduction)

Habitat ~ A place that provides seasonal or year-round food, water, shelter, and other environmental conditions for an organism, community, or population of plants or animals.

Noxious weed ~ A plant species designated by Federal or State law as generally possessing one or more of the following characteristics: aggressive and difficult to manage; parasitic; a carrier or host of serious insects or disease; or non-native, new, or not common to the United States. According to the Federal Noxious Weed Act (PL 93-639), a noxious weed is one that causes disease or has other adverse effects on man or his environment and therefore is detrimental to the agriculture and commerce of the United States and to the public health.

Potential Vegetation Group (PVG) ~ In this EIS, made up of potential vegetation types, grouped on the basis of similar general moisture or temperature environment.

Potential Vegetation Type (PVT) ~ In this EIS, all the species that might grow on a specific site in the absence of disturbance; can also refer to vegetation that would grow on a site in the presence of frequent disturbance that is an integral part of the ecosystem and its evolution.

Terrestrial ~ Pertaining to the land.

Viable population ~ A population that is regarded as having the estimated numbers and distribution of reproductive individuals to ensure that its continued existence is well distributed in the project area.

Introduction to Terrestrial Ecosystems

This section provides descriptions of terrestrial ecosystems found on landscapes in the project area, separated into Forestlands and Rangelands. (Riparian areas, which also have a terrestrial component, are discussed in more detail in the Aquatic Ecosystems section of this chapter.) Discussions of plant and animal species that inhabit forestlands and rangelands are provided to help complete the picture of what makes up terrestrial ecosystems. Broad-scale or landscape level descriptions of vascular plants, non-vascular plants (bryophytes), fungi, and lichens in the project area are also included. Changes on the landscape in vegetation and habitat, with explanations of how these changes affect management decisions today, are discussed to set the stage for the alternatives described in Chapter 3. Unless otherwise noted, material for this section was derived from the Scientific Assessment Landscape Ecology Staff Area Report (1996) and Terrestrial Staff Area Report (1996).

Overview of Project Area Forestlands and Rangelands

Forestlands and rangelands in the ICBEMP project area are highly diverse, ranging from moist areas near the crest of the Cascades to the Continental Divide in the Rocky Mountains. The basin contains mountain landscapes that commonly have elevations over 9,800 feet. Within these ranges, the valley bottoms can be low and the topography steep. These mountains and valleys are underlined by a variety of rock formations, and most have been altered by mountain and continental glaciation.

The varying soils and climates of forestlands and rangelands support a diversity of plant species, from those that require moist sites ~ such as western hemlock, western redcedar, and huckleberries ~ to dry-land species such as sagebrush and bluebunch wheatgrass. In the mountains of the basin, tree species range from mountain hemlock and subalpine fir at the higher elevations, to ponderosa pine in the valley bottoms. Mixed conifer forests dominated by white fir, grand fir, or Douglas-fir occupy many of the mid-elevation forests. Lodgepole pine forests are also found throughout much of the project area.

Huckleberries, buck brush, alder, and sagebrush are some of the shrubs found in the forests of the project area. Juniper, sagebrush, bitterbrush, and associated bunchgrasses occupy many low-elevation drier sites. Included in these mosaics of vegetation are productive riparian areas supporting willow, sedges and other similar species. In addition, plant species important to American Indians for food or spiritual uses are found in many locations throughout the project area, including forestlands, rangelands, and associated riparian areas. Plants used as food, for example, include camas, bitteroot, chokecherry, onion, cattail, and elderberry.

In addition to mountain landscapes, there are vast plains, prairies, deserts and rolling hills. Their landscapes vary depending on soils and climate, but often they are highly productive. In the absence of cultivation, sagebrush and grasses dominated the prairies and plains. Native Palouse prairie vegetation today is scarce in northern Idaho, where exotic plants now dominates large areas.

Because of the wide variety of plant species and landscape forms distributed throughout the project area, habitat for a wide variety of wildlife is found in the mountains, valleys, and rangelands of the basin. More than 13,000 terrestrial plant and animal species were considered in the Terrestrial Staff Area Report (1996), of which 547 are vertebrates. In the UCRB planning area, some 109 mammals, 283 birds, 23 reptiles, 15 amphibians, and approximately 715 invertebrates were assessed. Grizzly bears, black bears, and mountain lions, are some of the more notable wildlife species. Highly prized game species include Rocky Mountain elk, mule deer, and white tail deer. The bald eagle and northern goshawk are important raptors that prey on squirrels, chipmunks, woodpeckers, and a host of other species. Prominent rangeland wildlife species are pronghorn antelope, bighorn sheep, jack rabbits, sage grouse, numerous reptiles. Wildlife species of the project area listed by the Federal government under the Endangered Species Act include the threatened bald eagle and grizzly bear and the endangered peregrine falcon, woodland caribou, and gray wolf. The spotted frog is an example of a candidate species.

Change on the Landscape

Change has always been a part of forestlands, rangelands, and riparian areas. This section provides descriptions of changes in the recent past and present conditions on the landscape. As observed by Mehringer (1995), "change is continual and change is unpredictable." Species have distributed and redistributed themselves across the landscape in response to influences from various disturbances. The ebb and flow of glacial activity, repeated large-scale catastrophic floods, volcanic activity, and large-scale fires, along with smaller-scale disturbances such as drought and smaller fires, have created the ever-changing vegetative composition and structure within the project area. The geologic history that influences these interactions is described in the Physical Setting section of this chapter and in more detail in the Landscape Ecology Staff Area Report.

Just as climate cycles currently affect what types of vegetation will grow well in a particular area, vegetation also responded in the past to small- and large-scale climatic fluctuations. Fossil records show that forestlands and rangelands advanced and retreated across the ICBEMP project area in response to the advance and retreat of glaciers. The boundary between forestlands and rangelands has shown the most significant movement in recent geologic history, changing in elevation as climates changed (Mehringer 1995).

Volcanic activity, some at a much larger scale than the 1980 eruption of Mt. St. Helens in the State of Washington, removed or buried vegetation under layers of ash. In areas where vegetation was completely removed by lava or covered by ash, forestlands and rangelands slowly recolonized the bare soil. As the present day landscape was being molded, changes occurred over and over, at various degrees and in different places. As vegetation patterns changed and adjusted to the different environment, the landscape gained a new look; different plant and animal relationships developed. The numbers of animal species that could be supported by the landscape changed; through time, some species gained habitat, while others lost habitat.

Change continues today. Changes to the existing landscape also result from people's interaction with their environment. From burning fields to enhance the production of food resources, to the logging of forests to produce timber products, people have had an effect on vegetation, animals, and on people themselves.

How Vegetation was Classified

The existing vegetation within an area can be generally classified as being composed primarily of grass, forb, shrub, or tree species. Because the

vegetative cover present at any one time can vary based on past disturbances, the term *potential vegetation type* (PVT) is used to represent all of the species that might grow on a specific site in the absence of disturbance. Potential vegetation type can also refer to vegetation that would grow on a site in the presence of frequent disturbance that is an integral part of the ecosystem and its evolution. For example, the potential vegetation type that is called "Dry Douglas-fir with Ponderosa Pine" consists of Douglas-fir, ponderosa pine, and fescue bunch grass, which grows on these sites when disturbance is not present. If disturbance keeps the site from producing this mix of species, the site might instead be occupied by grasses and shrubs, ponderosa pine, and other species unique to this type.

Photo 2. Project area mountains, forests, and streams support diverse plant and animal populations and offer unparalleled recreational, cultural, and economic opportunities to people. Photo by Doug Basford

For this project, potential vegetation types were grouped into 15 *potential vegetation groups* (PVGs). These groupings were based on similar general moisture or temperature environments, and potential vegetation types. The 15 potential vegetation groups, along with the potential vegetation types that makes up each group, are listed in table 2-3.

In this section, vegetation and habitats in terrestrial ecosystems are discussed by potential vegetation group. Dry forest, moist forest, and cold forest potential vegetation groups are described in the Forestlands section of this chapter, while dry grass, dry shrub, cool shrub potential vegetation groups are discussed in the Rangelands section. Riparian shrub and riparian woodland potential vegetation groups are addressed in the Riparian Areas section under Aquatic Ecosystems.

Agricultural, urban, water, alpine, woodland, and rock potential vegetation groups are not discussed in detail in this EIS because they are less related to, or form extremely small components of BLM- or Forest Service administered lands in the UCRB, or are not used as major vegetation divisions for discussions in chapters 2–4.

Table 2-3. Potential Vegetation Types and Potential Vegetation Groups in the UCRB Planning Area

Potential Vegetation Group (PVG)	Potential Vegetation Types (PVTs)	Section in Which PVG is Discussed
Dry Forest	Dry Douglas-fir without ponderosa pine Dry Douglas-fir with ponderosa pine Dry grand fir/white fir Interior ponderosa pine	Forest
Moist Forest	Cedar/hemlock-Inland Moist Douglas-fir Grand fir/white fir-Inland Spruce-fir, wet	Forest
Cold Forest	Mountain hemlock-Inland Spruce-fir, dry with aspen Spruce-fir, dry without aspen Spruce-fir, (white bark pine greater than lodgepole pine) Spruce-fir, (lodgepole pine greater than white bark pine) White bark pine/alpine larch-North White bark pine/alpine larch-South	Forest
Dry Grass	Agropyron steppe Fescue grassland Fescue grassland with conifer	Forest
Dry Shrub	Antelope bitterbrush Basin big sage steppe Low sage-Mesic Low sage-Mesic with juniper Low sage-Xeric Low sage-Xeric with juniper Big sage-Warm Big sage-Cool Salt desert shrub Threetip sage	Rangeland
Cool Shrub	Mountain big sage-Mesic east Mountain big sage-Mesic east with conifer Mountain big sage-Mesic west Mountain big sage-Mesic west with juniper Mountain shrub	Rangeland
Riparian Shrub	Salix/carex Saltbrush riparian Mountain riparian low shrub	Riparian (Aquatics)
Riparian Herb	Riparian graminoid Riparian sedge	Combined with Riparian Shrub
Riparian/ Woodland	Cottonwood riverine Aspen	Riparian (Aquatics)
Woodland	Juniper Limber pine White oak Mountain mahogany Mountain mahogany with mountain big sage	Not addressed

Table 2-3. Potential Vegetation Types and Potential Vegetation Groups in the UCRB Planning Area (continued).

Potential Vegetation Group (PVG)	Potential Vegetation Types (PVTs)	Section in Which PVG is Discussed
Alpine	Alpine shrub-herbaceous	Not addressed
Agriculture	Irrigated crop land Dry crop/pastureland	Not addressed
Urban	Urban	Not addressed
Rock	Barren of vegetation	Not addressed
Water	Water	Not addressed

Source: Quigley and Arbelbide 1996.

Table 2-4 displays the current distribution and amount of major potential vegetation groups in the UCRB planning area. Maps 2-3 and 2-4 present the current distribution of PVGs in the UCRB planning area.

Terrestrial Species: Overview

How Wildlife are Described

Two ways to describe wildlife species were used in this project: "Key Ecological Functions" and

"Key Environmental Correlates". Key Ecological Functions are a wide range of roles that species play in the ecosystem, such as predation, herbivory, nutrient cycling, and biomass contributions. Key Environmental Correlates are environmental factors that are either associated with or required by a given species, such as forest canopies, downed wood, snags, or piles of bark. Both Key Ecological Functions and Key Environmental Correlates are used to discuss species habitats and terrestrial species in this chapter.

Some important *Key Ecological Functions* are the following:

- major biomass accumulations in an ecosystem,
- herbivory,
- nutrient cycling,
- interspecies relations (species that depend on each other),
- soils relations (species that interact with the soil, such as moles and voles),
- wood relations (decomposers), and
- water relations (amphibians and reptiles).

Important *Key Environmental Correlates* include the following:

- forest canopy,
- mistletoe brooms,
- dead parts of live trees,
- exfoliating bark,
- snags,
- downed wood,
- bark piles at the base of trees,
- litter and duff,
- fire processes and insects outbreaks, and
- recreation activity, roads, and trails (Terrestrial STAR 1996).

Changes in vegetation composition, distribution and structure, climate, water availability and quality, soil characteristics, and human disturbance may all affect the habitats of terrestrial species. The degree to which any species is affected depends on the magnitude of the changes, the ability of the species to move to other blocks of

Table 2-4. FS/BLM Area, in thousands of acres, by PVG within each ERU, within the UCRB.

ERU	Dry Forest	Moist Forest	Cold Forest	Dry Grass	Dry Shrub	Cool Shrub	TOTAL
5	29	159	1	15			**204**
6	39	82	24	39	2	77	**263**
7	342	4,084	725	1			**5,152**
8	387	3,735	169				**4,291**
9	509	658	1,570	46		18	**2,801**
10	113	23	10	187	5,262	3,068	**8,663**
11	22	4	23	57	2,837	279	**3,222**
12	180		237	27	75	8	**527**
13	4,242	2,987	4,913	1,123	1,046	1,346	**15,657**
TOTAL	**5,863**	**11,732**	**7,672**	**1,495**	**9,222**	**4,796**	**40,780**

ERU Legend: 5-Columbia Plateau; 6-Blue Mountains; 7-Northern Glaciated Mountains; 8-Lower Clark Fork; 9-Upper Clark Fork; 10-Owyhee Uplands; 11-Upper Snake; 12-Snake Headwaters; 13-Central Idaho Mountains

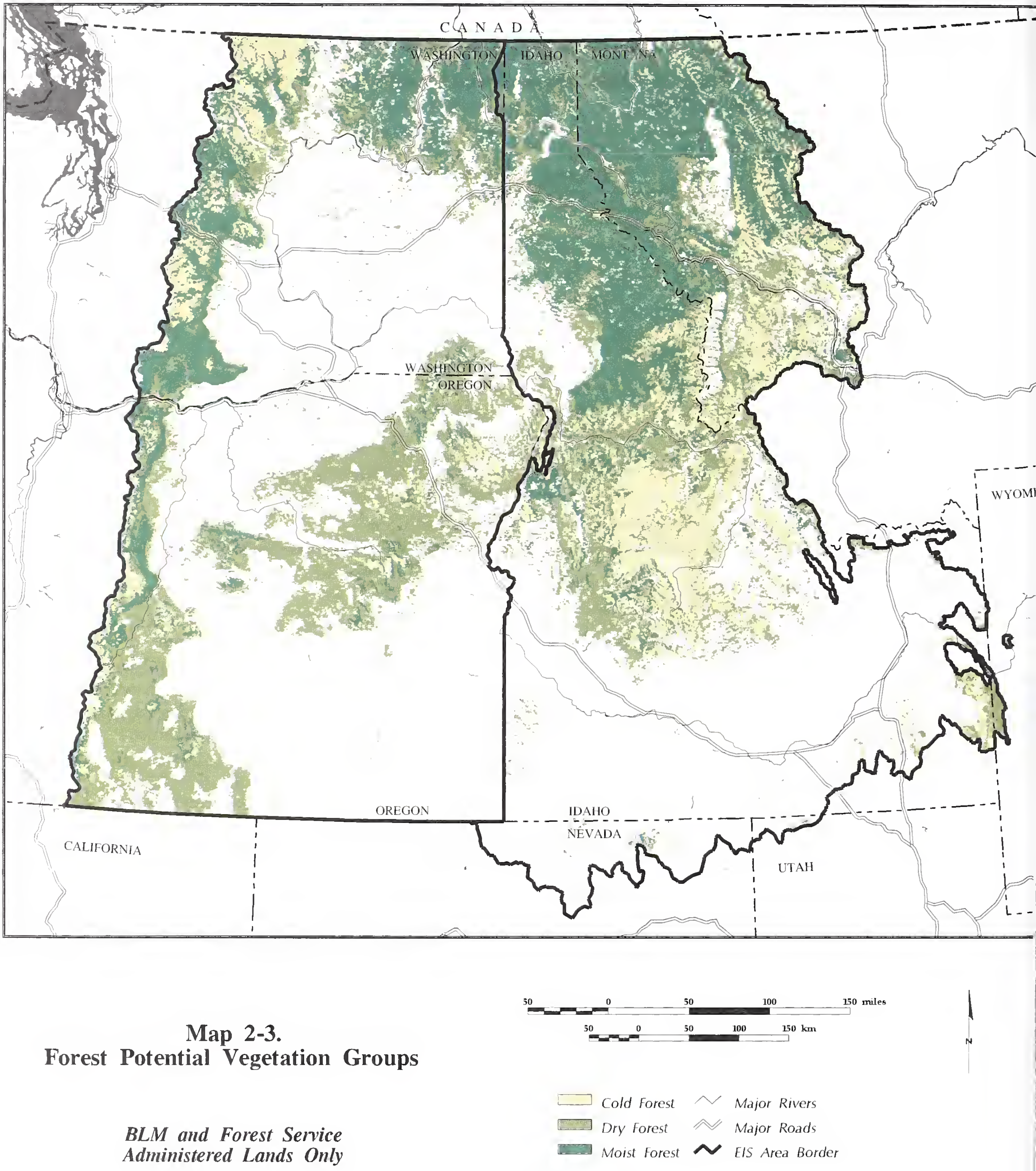
Source: ICBEMP GIS Data (1KM² raster data)

the same habitat or other habitats types, the distribution and interconnections of populations of species, the sensitivity of these species or its habitat to human activity, and many other factors that are not always well understood. Populations can increase or decrease because of habitat changes that affect their distribution, density, access to habitat, or a combination of all three. Thus, what may be harmful to one species may benefit or have no affect on another, or may affect the ways that terrestrial species interact with and affect each other (Terrestrial STAR 1996).

Terrestrial habitat trends are not meant to be interpreted necessarily as population size trends for individual species. In part this is because abundance of animals can be affected by factors other than habitat quality, quantity, or distribution. For example, even if habitat remains constant, climatic conditions during breeding or wintering may cause a change in a species population size or density. However, many local habitat changes may affect certain species or groups of species. Specific changes in wildlife habitat related to vegetation are discussed in the Forestlands and Rangeland sections.

Not all information is known about all species and their habitat needs or current conditions within the entire project area. Because of the great variation and complexity of habitats within an area this large, it would be undesirable and unrealistic to always apply species habitat relationship needs basin wide. For example, while some species occur throughout the basin, it would be unwise to use habitat relationships in the moist forest types of northern Idaho and Montana for the same species of animal that also occurs in the dry or cold forest types of southern Idaho; some of their needs will be the same and some will not, depending on the individual species. Local habitat conditions to which most species have adapted need to be evaluated for applicability.

Plant communities and their successional stages – as well as many other environmental factors – thus provide unique environmental conditions that are ecologically important as niches for wildlife species (Thomas et al. 1979). Many terrestrial wildlife species can be located in more than one forestland or rangeland PVG, in part because in some cases the important characteristic for a particular wildlife species may be a certain vegetative structure that can be found in more than one vegetation type. (For example, some wildlife species need large diameter trees; the particular species of tree may be unimportant to some of these wildlife and important to others). Some of the information from the Terrestrial Staff Area Report (1996) data bases enabled the Science Team to discuss wildlife species or groups separately within particular forest or range potential vegetation groups. Therefore, this EIS

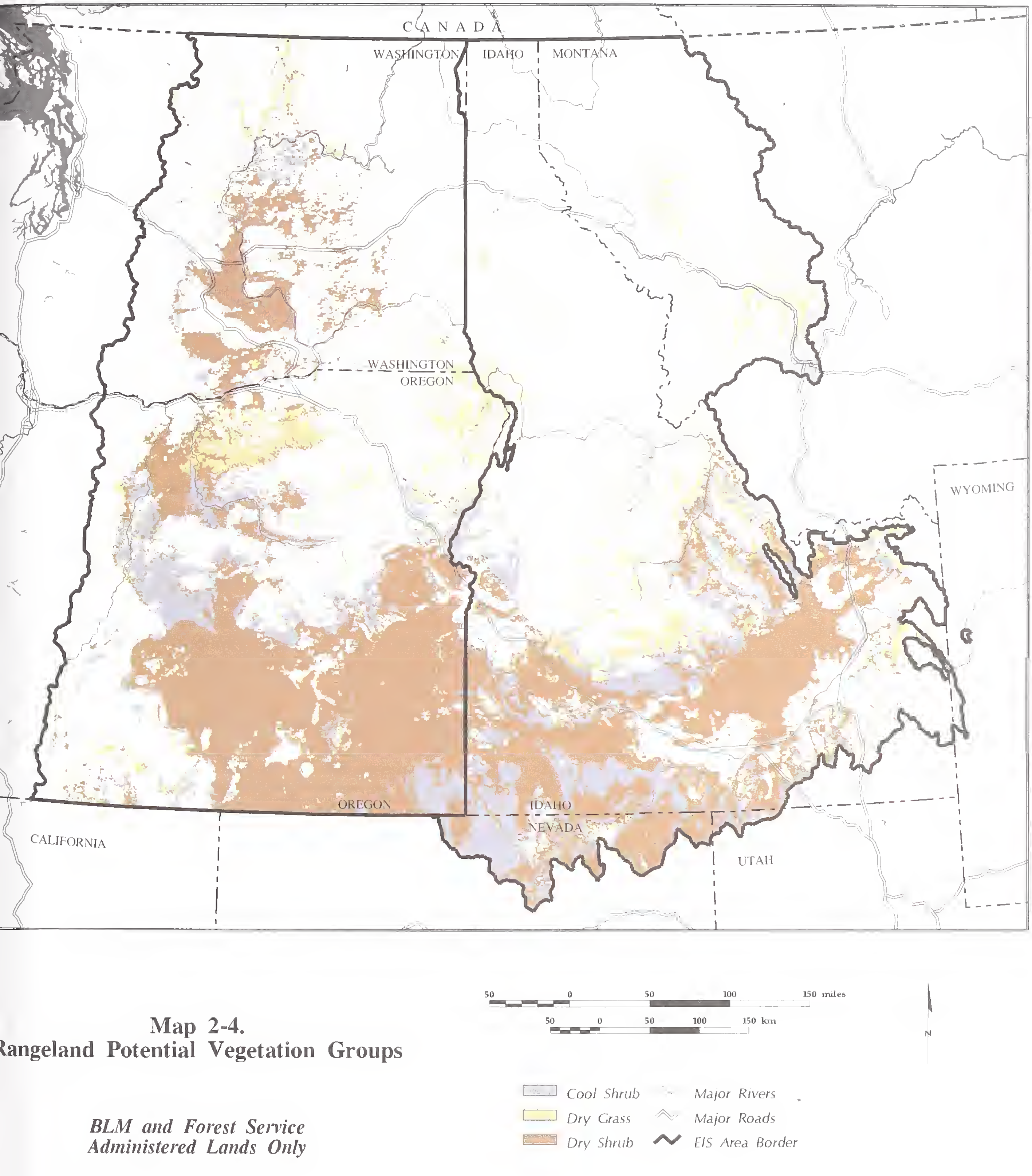


Map 2-3.
Forest Potential Vegetation Groups

BLM and Forest Service Administered Lands Only

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996



Map 2-4.
Rangeland Potential Vegetation Groups

BLM and Forest Service Administered Lands Only

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996

displays more detailed wildlife information by PVG where possible, for ease of tracking changes in vegetation within the landscape and the broad-scale effects of changes on terrestrial wildlife species.

Federally Listed Threatened, Endangered, and Candidate Species

Among terrestrial species in the ICBEMP project area, the bald eagle and the grizzly bear are federally listed threatened species; the peregrine falcon, woodland caribou, and gray wolf are endangered species. The Idaho ground squirrel is listed as a candidate species, with a distribution limited to localized mountain meadows in west central Idaho. All of the terrestrial listed threatened or endangered species, except the gray wolf, have recovery plans or strategies approved by the Fish and Wildlife Service. The grizzly bear, woodland caribou, and gray wolf are known to occur in northern Idaho and Montana, where they also interact with populations in British Columbia and Alberta. Although a recovery plan has not been approved for wolves, there is an EIS for reintroduction, which provided the basis for wolves being reintroduced in Idaho in 1995 and 1996. Grizzly bears and woodland caribou occur in Idaho and Montana in the Northern Glaciated Mountains (ERU 7). See Appendix E for maps of wolf and grizzly bear recovery areas and a list of threatened and endangered species within the UCRB planning area and the status of their recovery plans.

Populations of both peregrine falcons and bald eagles are static or increasing slightly in the project area. Bald eagles have recently been "down-listed" from endangered to threatened, and a similar proposal is being considered for the peregrine falcon. In both cases, the primary reason for recovery is restriction of pesticides that caused eggshell thinning and reproductive failures, but habitat improvement and road and human access management also contributed to their increase.

Not all Federal candidate species or agency Sensitive species are necessarily in decline; some species are little-known or naturally rare because of habitat rarity. It is suspected that no vertebrate species have recently gone extinct throughout their range in the project area in recent decades. Although it is possible that undescribed, locally endemic species or subspecies might have vanished before they could be studied, information on other taxa is lacking (Terrestrial STAR 1996).

For discussion of federally listed plant species, see discussion on rare plants, below.

Species Viability and Other Aspects of Terrestrial Integrity

The Science Integration Team developed three broad concepts to assess terrestrial ecosystems, which contributed to preparation of the Terrestrial Ecosystems section of this chapter. The three concepts, which have management implications at multiple scales, are the following:

- **Species viability**: *Includes threatened and endangered species, vertebrate candidate species, locally rare plants, and rare plants listed in natural heritage data bases: representing species that are commonly thought to have viability concerns.*
- **Long-term evolutionary potential**: *Includes rare species, endemic species, and high biological diversity "Hot Spots" (see maps 2-5 and 2-6): representing species that may require some level of additional management emphasis to achieve their long-term evolutionary potential. These groups of species occur in very restricted places and are highly susceptible to local extirpation.*
- **Multiple ecological scales and evolutionary time frames**: *Includes species assemblages and ecosystems that are at the edge of their ranges within the project area. Species at the edge of their ranges often develop attributes or adaptions that result from local ecological conditions not present in the heart of the range. Such "fringe" areas often are locations important to species' evolutionary processes.*

Rare Plants, Lichens, Bryophytes

While most of the vegetation section of this chapter focuses on the more common plant communities that comprise forest and rangeland ecosystems, rare or sensitive plant species and smaller and less known (but many times critical) plants form the base of each community in the ecosystem.

The project area is known to support more than 12,000 plant species (table 2-5), including about 8,000 vascular plants and about 4,000 species of non-vascular plants and plant allies (fungi and lichens). This richness in plant diversity is a reflection of the many different habitats found in the interior Columbia River Basin, ranging from

alpine to desert conditions with different bedrock, soils, and temperature and moisture regimes. Plants are primary producers that convert the energy of the sun into food and nutrients for all living organisms, making plants the most critical component in the maintenance of ecosystems. In addition to their ecosystem function, plant communities provide the foundation for the economic and social fabric of the basin. Commercial resources critical to the region's economy are provided by plants, including trees, forage and other special plant products.

Many groups of plants and related organisms play multiple but often poorly understood roles in functional and sustainable ecosystems. Different levels of information are available for each plant, fungus, lichen, or bryophyte group. The vast majority of plant data is available for vascular plant species that are currently listed as threatened, endangered, or sensitive. Considerably less local data is available for the bryophytes, fungi, and lichens.

Fungi

Fungi are the least understood group of plant-related organisms in the project area. A key role of fungi in ecosystems is that of decomposer, recycling nutrients within an ecosystem to make them available for use by other living organisms. Many species of fungus also play a role in facilitating moisture and nutrient absorption by plants through beneficial mycorrhizal relationships with plant roots.

Special Status Species

Special Status species include federally listed threatened or endangered species: Federal candidate species; special recognized as requiring special protection by State agencies and species managed as sensitive species by the Forest Service and/or BLM.

The Endangered Species Act of 1973 provides a program for the conservation and recovery of threatened and endangered species as well as a means to protect the ecosystems upon which such species depend. According to the U.S. Fish and wildlife Service, an **Endangered Species** is any species in danger of extinction throughout all or a significant portion of its range. A **Threatened Species** is any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Species may also be designated as Candidate Species if available data suggest that T&E designation may be appropriate; **Candidate Species** are those that may be proposed (as threatened or endangered) and listed in the future. The U.S. Fish and Wildlife Service recently revised its list of candidate species (February 28, 1996 Federal Register). Under their new system, only those species for which they have enough information to support a listing proposal will be called candidates.

Other management agencies use additional terminology to identify the State or agency status of rare species. The Forest Service and the BLM maintain regional lists of **Sensitive** species for which there are significant current or predicted downward trends in population numbers, density, or habitat capability; or species with limited distribution.

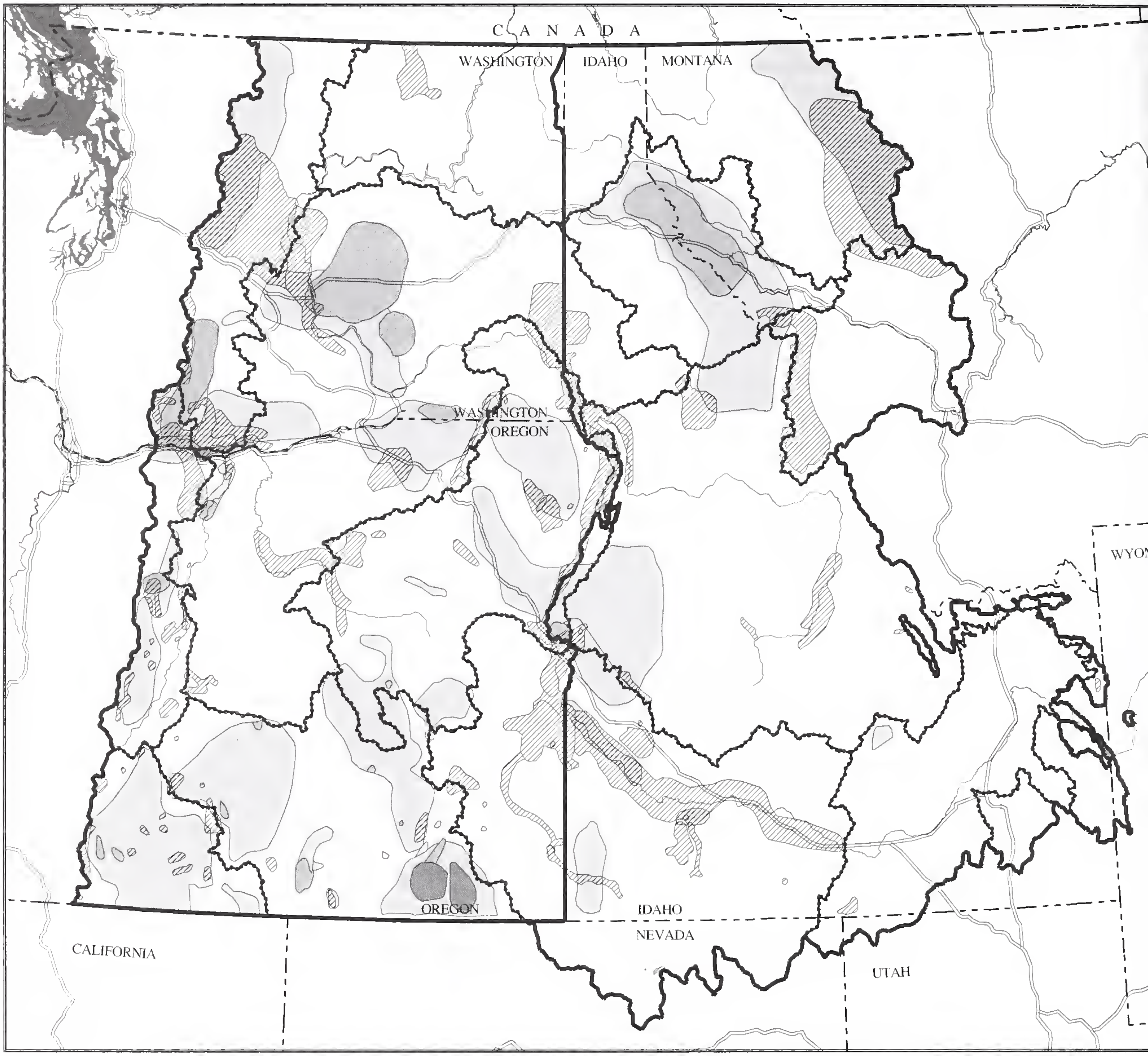
Table 2-5 provides the number of species of terrestrial organisms that exist in the project area; the number of federally listed threatened, endangered, candidate and proposed species; and BLM- or Forest Service-designated sensitive species (Landscape Ecology STAR 1996).

Table 2-5. Numbers and Status of Terrestrial Species in the ICBEMP Project Area.

	Total # of Species		Federally Listed, Proposed, or Candidate				FS/BLM
Type	Known	Est.	Threat.	Endang.	Prop.	C	Sensitive
Invertebrate	3,780	24,270	1	5	0	0	23
Amphibian	26	26	0	0	0	1	11
Reptile	27	27	0	0	0	0	9
Bird	283	283	3	2	0	1	85
Mammal	132	132	1	2	0	1	30
Plants	12,797	18,946	3	2	1	4	526

Abbreviations: Est. = Estimated; Threat. = Threatened; Endang. = Endangered; Prop. = Proposed; C = Candidate

SOURCE: Terrestrial STAR 1996; Sensitive Lists (see Appendix E).



Map 2-5. Endemic Species

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

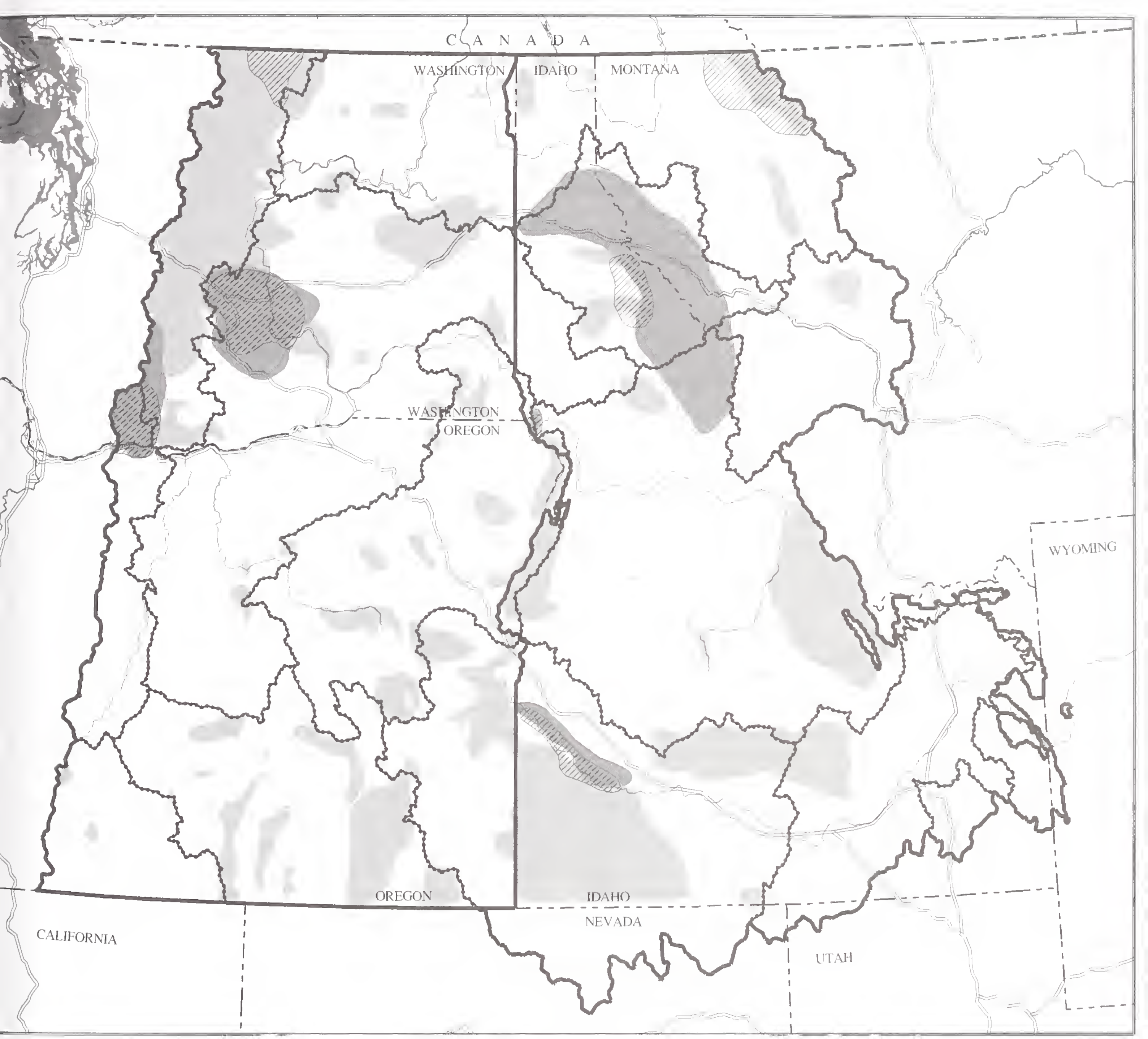
Project Area
1996

50 0 50 100 150 miles
50 0 50 100 150 km

N

One Endemic Animal Species
Two Endemic Animal Species
Three Endemic Animal Species
One Endemic Plant Species
Major Rivers
Major Roads
EIS Area Border
ERU Boundaries

*Ecological reporting unit names and numbers are found on Map 1-1.



Map 2-6.
Areas of High Biodiversity for Plants and Animals

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996

50 0 50 100 150 miles
50 0 50 100 150 km

N

- High Plant Biodiversity
- High Animal Biodiversity
- Areas of High Biodiversity for Plants and Animals
- Major Rivers
- Major Roads
- EIS Area Border
- ERU Boundaries

*Ecological reporting unit names and numbers are found on Map 1-1.

Other species of fungi in the project area are of commercial value and economic importance. Because of the limited knowledge of this group of organisms in the project area, effects of management activities on fungi are difficult to determine. Hence, this group will not be discussed further in this document, but readers may refer to the Terrestrial Staff Area Report (1996) for additional information.

Lichens

Lichens, which are organisms made up of algae and fungi, are represented by at least 736 species in the project area. Lichens function in a wide variety of ecosystems as food sources for animals (such as deer, elk, caribou, flying squirrels, red-backed voles, and woodrats) and as contributors of living matter to forest and rangeland soils. Birds and small mammals use lichens as nest–building material. Lichens also absorb moisture (when attached to tree branches). Microbiotic crusts in rangeland environments consist of both lichens and bryophytes, covering and protecting what otherwise would be bare soil between grass clumps and/or shrubs. Lichens also play a role in the initial establishment of plant communities on such surfaces as bare rock, through the breaking down of rock into soil surfaces more conducive to plant growth. Some lichens are used as foods by American Indians and others are used as bioindicators for air quality, or as environmental purifiers where they accumulate heavy metals. Other species of lichens may prove to have medicinal values.

Lichens are affected when their substrate (dead plant matter, tree bark, tree trunks without bark, rock, soil) is modified such as through timber harvest, mining, livestock grazing, fire, and invasion of exotic annuals. Lichens also appear to be sensitive to the planting of uncharacteristically high numbers of trees; artificially dense forest stands create unsuitable habitat for most lichens. One lichen is currently listed as a candidate species. Basic knowledge about these species and their interactions is limited, and hence will not be discussed further in this document.

Bryophytes

Non-vascular plants (bryophytes) include mosses, liverworts, and hornworts. Like other plant relatives, bryophytes are poorly known, and some lack even the most basic information. Approximately 383 individual types are known to occur; 46 of these are considered rare or sensitive. Bryophytes are found on such substrates as: wet soil, alkali soil, calcareous rock, peatlands, geothermal areas, and decaying wood. Since bryophytes produce chlorophyll (a green pigment that absorbs light, which is converted into food and nutrients for other living organisms), they function in ecosystems as a food source. Bryophytes, much like lichens, also play a role in the initial establishment of plant communities on such surfaces as bare rock through the breaking down of rock into soil more conducive to plant growth.

As a group, bryophytes are affected by the same activities as lichens. For species found on wet rock, or for aquatic submerged species, changes in water quality may affect bryophyte composition and distribution. Like other plant-related species, basic knowledge about bryophytes and their interactions is limited, and hence they are not discussed further in this document.

Vascular Plants

Approximately 8,000 vascular plant species are found in the project area. Vascular plants are "ordinary" plants which have roots, stems, leaves, and reproductive structures. Included in the vascular plant group are ferns, cone-bearing plants (conifers), and flowering plants. The vascular plants of the project area are remarkably diverse, with species inhabiting a wide spectrum of habitats.

Vascular plants function as the basis of the food webs that sustain life on earth. Vascular plant species also protect exposed soil from the erosive forces of wind and water through the binding action of their roots. They further serve to regulate stream temperatures by providing shade to streams, enhancing habitat for aquatic and riparian area-dependent species.

Among the vascular plant species known in the project area, 154 are regionally endemic and 87 are of concern to American Indian tribes. Approximately 526 of the species are Sensitive or of special management concern for the Forest Service or BLM. One finding of the Scientific Assessment was that plant species or groups in the native bunch grass types and low elevation cedar/hemlock forests currently have the lowest amount of habitat area and also showed the greatest negative change (loss) over time (Terrestrial STAR 1996). Species federally listed as threatened occurring in the UCRB planning area include: Howellia (*Howellia aquatilis*), MacFarlane's four o'clock (*Mirabilis macfarlanei*), and Ute's lady-tresses (*Spiranthes diluvialis*). There are no species listed as endangered.

Noxious Weeds

Approximately 862 exotic (non-native) plant species have been documented in the Columbia River Basin, of which 113 are considered noxious weeds (Terrestrial STAR 1996). "Noxious" is a legal classification rather than an ecological term. Plants that can exert substantial negative environmental or economic impact can be designated as noxious by various Government agencies. Federal and State laws require certain actions directed at the management of noxious weeds.

Vegetation in both forestlands and rangelands in the project area is being invaded by noxious weeds at an accelerating rate, jeopardizing consumptive and non-consumptive uses and public expectations, including livestock grazing, timber production, and wildlife and scenery viewing. Noxious weeds reduce these uses by displacing native plant species and lessening natural biological diversity, degrading soil integrity, nutrient cycling and energy flow, and interfering with site recovery mechanisms (such as seed banks) that allow a site to recover following disturbance.

Natural Areas

Natural Areas are defined here as areas that are managed by various landowners for a variety of purposes but that are maintained in a relatively natural state, with minimal human disturbance. Natural Areas are designated for purposes of recreation, research, monitoring, habitat protection, education, and scenic quality. They include designated Wilderness Areas, Wilderness Study Areas, Research Natural Areas, Areas of Critical Environmental Concern, Botanical Areas, and similar areas. They can occur in all categories of land allocations and can vary in management objectives and allowed uses. Natural Areas are intended to represent the spectrum of vegetation, habitat, physical settings, and land types within a region.

Natural Areas are distributed throughout the interior Columbia River Basin. Within the ICBEMP project area approximately 28 percent of the land area is within some type of Natural Area designation or category. Natural Areas in the project area tend to be in the upper elevation, forested portions of the landscape. The cold forest types represent approximately 35 percent of the area that is within Natural Areas (mainly Wilderness or Wilderness Study Areas) because of their scenic beauty, recreation demand, and lack of roads and development (Terrestrial STAR 1996). Moist and mid-elevation forests have 9 percent within Natural Areas, although some of these forests are also represented in some unroaded areas. Lower elevation forested habitats have the least representation within Natural Areas.

Of the non-forested (rangeland) areas included within congressionally or administratively designated Natural Areas, 5 percent of cool shrub, 3 percent of dry grass and dry shrub, 7 percent of riparian shrub, and 7 percent of woodland are represented. This compares to 59 percent representation of alpine areas, 35 percent of cold forest, and 55 percent of rock areas within Natural Area designations (includes all ownerships within the project area). In summary, relatively few rangeland types are being specifically managed under low human disturbance regimes for the general goals of established Natural Areas (Terrestrial STAR, in press).

The *Scientific Assessment* (Quigley and Arbelbide 1996) analyzed the size-class distribution of Natural Areas and vertebrate home ranges to determine the value of Natural Areas in maintaining vertebrate communities. All Natural Areas and species were pooled without regard for habitat composition and use difference. For this broad treatment, the simplifying assumption was made that Natural Areas were isolated from adjacent habitat that might have increased the effective area of the Natural Area for species conservation and management. In reality, this may not always be the case, as much of the land surrounding some Natural Areas also contributes suitable habitat for vertebrates species (Terrestrial STAR 1996).

Even small Natural Areas (<125 acres) would be expected to contain at least one individual, and perhaps small populations, of about 70 percent of vertebrate species. Natural Areas larger than 1,600 acres would be expected to contain 90 percent of the vertebrate species in the area. Natural Areas would have to be at least 24,710 acres in size before 99 percent of the vertebrate species would be expected to occur. Of existing Natural Areas in the project area, 16 percent are larger than 24,710 acres. Expectations of species occurrence based on home range size does not necessarily mean that a particular size Natural Area would contain viable populations of all associated species. Natural Areas would have to be several times larger than the area of an individual home range of most species to support enough individuals for a viable population. Many factors relative to species would need to be considered to ensure that Natural Areas fully address viability concerns (Terresrial STAR 1996).

Forestland

Key Terms Used in This Section

Biophysical template ~ The successional and disturbance processes, landform, soil, water, and climate conditions that formed the native system with which species of plants and animals evolved.

Disturbance ~ Refers to events that alter the structure, composition, or function of terrestrial or aquatic habitats. Natural disturbances include, among others, drought, floods, wind, fires, wildlife grazing, and insects and pathogens. Human-caused disturbances include actions such as timber harvest, livestock grazing, roads, and the introduction of exotic species.

Downed wood ~ A tree or part of a tree that is dead and laying on the ground.

Key Ecological Functions ~ A wide range of roles that species play in the ecosystem, such as predation, herbivory, nutrient cycling, and biomass contributions.

Key Environmental Correlates ~ Environmental factors that are either associated with or required by a given species, such as forest canopies, downed wood, snags, or piles of bark.

Landscape structure ~ The mix and distribution of stand, or patch sizes across a given area of land. Patch sizes, shapes and distributions are a reflection of the major disturbance regimes operating on the landscape.

Landscape composition ~ The types of stands, or patches present across a given area of land.

Old Forest ~ (a) Old single story forest refers to mature forest characterized by a single canopy layer consisting of large or old trees. Understory trees are often absent, or present in randomly spaced patches. It generally consists of widely spaced, shade-intolerant species, such as ponderosa pine and western larch, adapted to a nonlethal, high frequency fire regime. (b) Old multi-story forest refers to mature forest characterized by two or more canopy layers with generally large or old trees in the upper canopy. Understory trees are also usually present, as a result of a lack of frequent disturbance to the understory. It can include both shade-tolerant and shade-intolerant species, and is generally adapted to a mixed fire regime of both lethal and nonlethal fires.

Patch (stand) ~ An area of homogeneous (uniform) vegetation, different from surrounding vegetation in its structure or composition

Regeneration ~ The process of establishing a new crop of trees on previously harvested land; also refers to the new crop of trees that have become established.

Seral ~ The developmental phase of a forest stand with characteristic structure and plant species composition; typically, young-seral forest refers to seedling or sapling growth stages; mid-seral forest refers to pole or medium sawtimber growth stages; and mature or old-seral forests refers to mature and old-growth stages.

Species composition ~ The mix of different types of trees that are growing in a forest. Can include both shade-intolerant and shade-tolerant species.

Shade-intolerant ~ Species of plants that do not grow well or die from the effects of too much shade. Generally these are fire-tolerant species.

Shade-tolerant ~ Species of plants that can develop and grow in the shade of other plants. Generally these are fire-intolerant species.

Stand (patch) density ~ The number of trees growing in a given area, usually expressed in terms of trees per acre.

Stand (patch) structure ~ The mix and distribution of tree sizes, layers, and ages in a forest. Some stands are all one size (single story), some are two story, and some are a mix of trees of different ages and sizes (multi-story). (See table 2-6 for structural stages used in this EIS to describe stand structure.)

Succession ~ A predictable process of changes in structure and composition of plant and animal communities over time. Conditions of the prior plant community or successional stage create conditions that are favorable for the establishment of the next stage. The different stages in succession are often referred to as "seral stages."

Summary of Conditions and Trends

The following trends have been noted in the forested areas of the project area because of departures from native disturbance and successional processes since historical times. These broad-scale changes in forest health conditions have influenced the susceptibility of forests to uncharacteristic wildfires and large-scale insect and disease events, and have affected habitat for many wildlife species.

◆ Interior ponderosa pine has decreased across its range, with a significant decrease in the amount of old single story structure. The primary transitions were to interior Douglas-fir and grand fir/white fir.

◆ Loss of the large tree component (live and dead) within roaded and harvested areas. This decrease affects terrestrial wildlife species closely associated with these old forest structures.

◆ Western larch has decreased across its range. The primary transitions were to interior Douglas-fir, lodgepole pine, or grand fir/white fir.

◆ Western white pine has decreased 95 percent across its range. The primary transitions were to grand fir/white fir, western larch, and shrub/herb/tree regeneration.

◆ The whitebark pine/alpine larch cover type has decreased 95 percent across its range, primarily through a transition into the whitebark pine cover type. Overall, however, the whitebark pine cover type has also decreased, with compensating increases in Engelmann spruce/subalpine fir.

◆ Generally, mid-seral forest structures have increased in dry and moist forest potential vegetation groups, with a loss of large scattered residual shade-intolerant tree components and an increase in density of smaller diameter shade-tolerant trees.

◆ There has been an increase in fragmentation and loss of connectivity within and between blocks of habitat, especially in lower elevation forests and riparian areas. This has isolated some wildlife habitats and populations and reduced the ability of populations to move across the landscape, resulting in long-term loss of genetic interchange.

◆ Human access for all types of uses has increased because of increasing human population in the basin. Increased access has decreased the availability of areas with low human activities, which are important to large forest carnivores and omnivores, and increased the risk of conflicts between these wildlife species and humans.

'Forest health' is defined as the condition in which forest ecosystems sustain sufficient complexity, diversity, resiliency, and productivity to provide for specified human needs and values. It is a useful way to communicate about the current condition of the forest, especially with regard to resiliency, a part of forest health which describes the ability of the ecosystem to respond to disturbances. Resiliency is one of the properties that enable the system to persist in many different states or successional stages. Forest health and resiliency can be described, in part, by species composition, density, and structure.

Introduction to Forestlands

Forest-related issues raised by the public during the scoping process show a growing concern for wildfire, insect and disease infestations, exotic species, resource management practices, and human uses that may affect forest health and productivity. Forests are constantly changing through a combination of disturbances, such as fire, climate, insects, disease, timber harvest, and grazing. Change determines the plant and animal species that will exist in forested areas, and governs future products, recreational opportunities, habitats, and other resources provided by forests.

The forestland potential vegetation groups in this section are described by distribution, composition, and structure, historical conditions, and current conditions (departures from disturbance patterns and processes) as well as by terrestrial wildlife species and their habitats and associated changes.

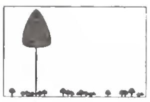
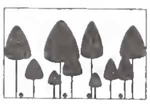
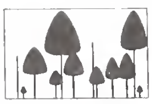
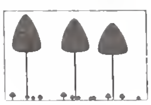
Succession and Disturbance

Plants respond to influences and disturbances from animals, people, and even other plant species by growing in patterns of succession. "Succession" refers to a predictable process of changes in structure and composition of plant and animal communities over time. Successional (or seral) stages often are described in terms of "early-", "mid", or "late" to reflect the species and/or condition of vegetation and animal communities generally characteristic at different times during succession. "Disturbance" refers to events that alter the structure, composition, and/or function of terrestrial or aquatic habitats. Disturbances in the native interior Columbia River Basin system generally follow cycles of infrequent, high intensity events (such as drought, floods, or crown fires) interspersed with frequent, low intensity events (such as nonlethal underburns, annual wildlife grazing cycles, or scattered mortality from bark beetles).

Forest succession is the set of stages that plant communities go through, from young stands of trees to old forests. Table 2-6 presents the seven structural stages used in this EIS to depict forest successional stages:

Successional growth and development of vegetation, combined with disturbance, result in vegetation changes across the forested landscape. The interaction of successional and disturbance processes, constrained by the dynamics of landform, soil, water, and climate, creates the basic "native biophysical template" in which native species have evolved. Insect, disease, and fire disturbance events react differently, and affect the forested stands differently, depending on species composition, density, and structure. Regional-scale changes in landscape patterns over time can be described as changes in vegetation structure (heights, sizes, and ages of vegetation) and composition (percent of each species occurring on a site), and can characterize changes that have occurred in

Table 2-6. Forest Structural Stages

	Structural Stage	Definition	In this EIS, Also Called Seral Stage:
	**Stand initiation**	When growing space is reoccupied following a stand–replacing disturbance	"Early Successional" or "Regeneration" or "Early Seral"
	**Stem exclusion - open canopy**	Those forested areas where the occurrence of new tree stems is moisture limited	"Mid-successional" or "Young Forest" or "Mid-seral"
	**Stem exclusion - closed canopy**	Those forested areas where the occurrence of new tree stems is predominantly light limited	
	**Understory reinitiation**	When a second generation is established under an older, typically early seral, overstory	
	**Young forest multi-story**	Stand development resulting from frequent harvest or lethal disturbance to the overstory	
	**Old multi-story**	Those forested areas lacking frequent disturbance to understory vegetation	"Late Successional" or "Mature and Old Forest" multi-story or "Late Seral"
	**Old single story**	Those forested areas resulting from frequent nonlethal natural or prescribed underburning or other management	"Late Successional" or "Mature and Old Forest" single story or "Late Seral"

successional and disturbance processes, which may indicate changes in ecological function and overall forest health. Figure 2-4 illustrates the successional and disturbance processes in forested landscapes in the UCRB.

Species of trees that grow better in sunlight (shade-intolerant species) dominate environments that are fairly open, with little shade created by other species; they often establish in newly opened forest areas. If fires do not remove tree reproduction, stand density increases and creates shade on the forest floor, which allows seedlings of shade-tolerant species to establish. Most shade-tolerant species are readily killed by fire, especially when they are young. Where fires were frequent, the presence of shade-tolerant tree species was limited, but without such disturbance, these shade-tolerant species would grow to maturity and eventually dominate the forest. Where fire, harvest, wind, or other disturbance returned sunlight to the forest floor, shade-intolerant species would again establish. A partial list of common shade-tolerant and shade-intolerant tree species is in Table 2-7.

Successional and disturbance processes have changed considerably since settlement of the project area. New disturbances (such as harvest and the introduction of exotic species), as well as changes in the frequency or intensity of disturbance processes resulting from fire exclusion, have created conditions and disturbance regimes different from those to which native plant and animal species have adapted. Figures 2-5 through 2-10 summarize the changes in seral stages and shade tolerance by PVG that have occurred in the project area. Maps 2-7 and 2-8 show historical and current fire regimes in project area forestlands and rangelands.

Terrestrial Wildlife Species and Habitats: General Considerations For All Forest PVGs

The Forestland discussions of wildlife focus on species that provide "Key Ecological Functions" and species that depend on certain environmental factors referred to as "Key Environmental Correlates" (see Introduction to Terrestrial Ecosystems for additional details).

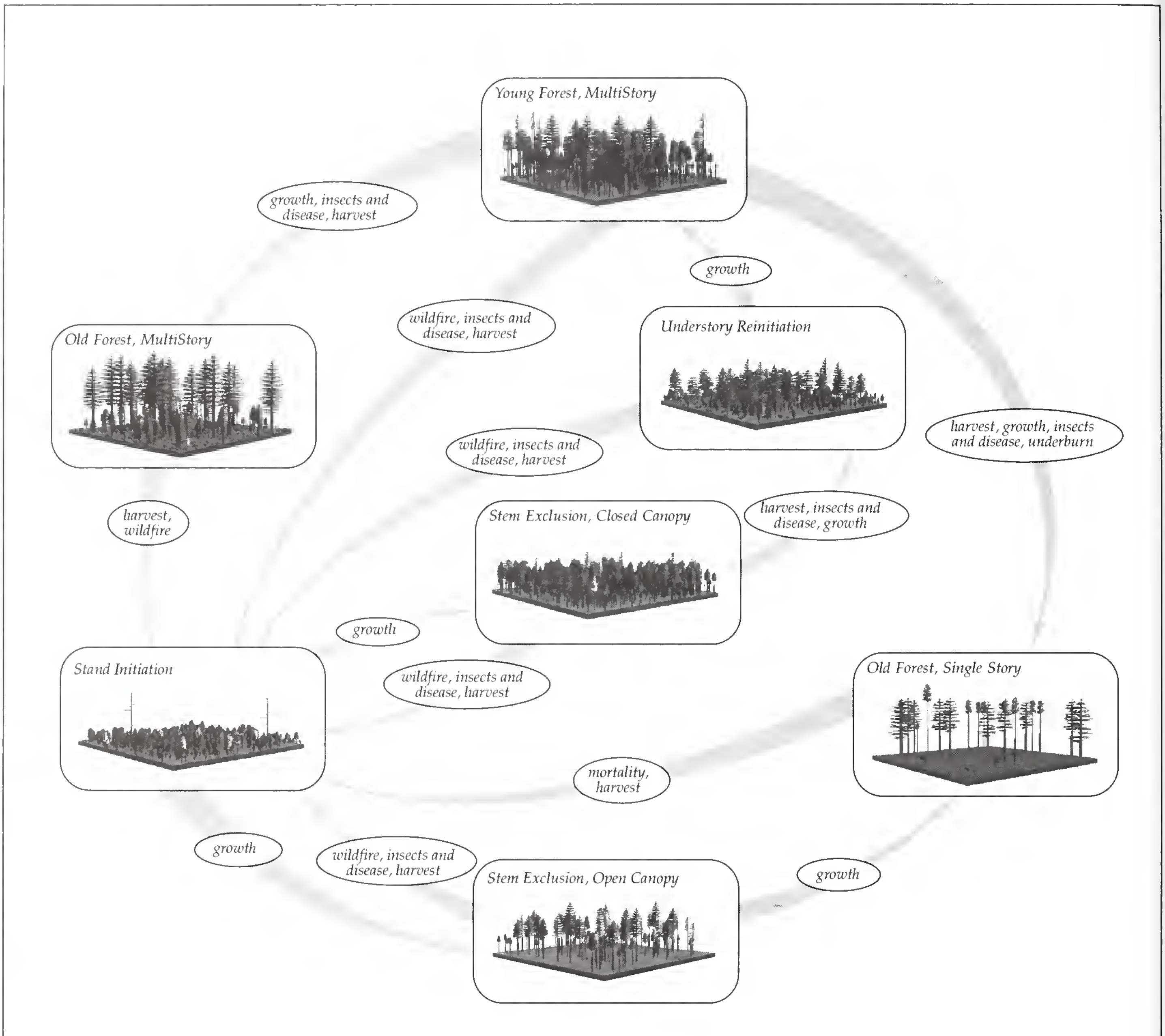
Many of the terrestrial wildlife species can be located in several forest PVGs, while some species are restricted to one or two PVGs. For example, woodpeckers need dead trees for nesting and feeding. For the hairy woodpecker, the species of dead tree is not as important for nest site selection as the size (it needs to be greater than 10 inches in diameter). For the pileated woodpecker, on the other hand, the size (greater than 20 inches in diameter) *and species* of the tree are important for nesting and feeding. Therefore, hairy woodpeckers can be found in all forest PVGs (three), but pileated woodpeckers will occur only in two of the forest PVGs because of the combined tree size and tree species limitations.

The project area forestlands include six species of large carnivores and omnivores including grizzly and black bears, gray wolves, mountain lions, lynxes, and wolverines. The grizzly bear and gray wolf are federally listed under the Endangered Species Act; the Canada lynx has recently undergone a status review by the Fish and Wildlife Service to determine whether it should be listed. Two smaller carnivore species, the Pacific fisher and American marten, are considered species of concern. Carnivores and omnivores are at the top of the food chain (figure 2-11) and are indicators of total biodiversity and ecosystem health.

Table 2-7. List of Common Shade-tolerant and Shade-intolerant Tree Species in the UCRB Planning Area

Shade-tolerant Tree Species	Shade-intolerant Tree Species
Grand fir	Western white pine
White fir	Interior ponderosa pine
Douglas-fir (sometimes)	Lodgepole pine
Engelmann spruce	Douglas-fir (sometimes)
Subalpine fir	Western larch
Western hemlock	Whitebark pine
Western redcedar	Aspen

Figure 2-4. Forest Successional and Disturbance Processes



Over time, forest structures change in one or more directions, depending on the type and degree of natural and/or human-induced disturbances.

b_trajec

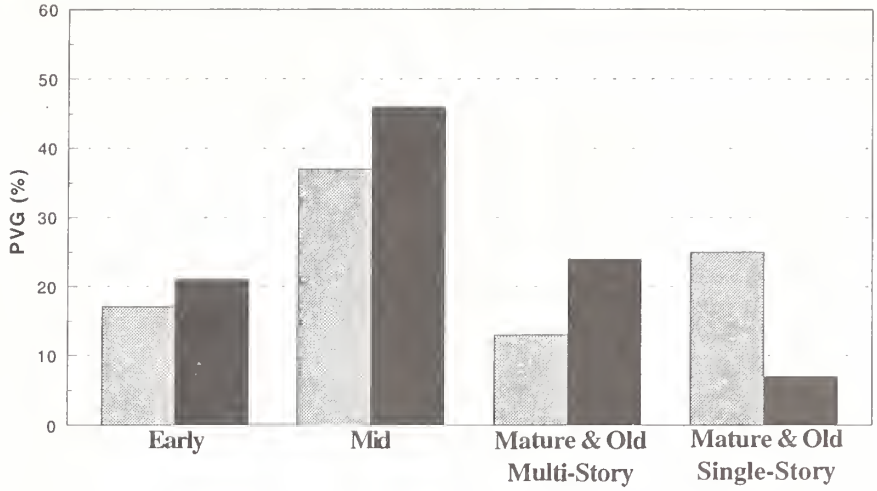


Figure 2-5. Historical and Current Seral Stages in Dry Forest PVG as Percentage of the PVG.

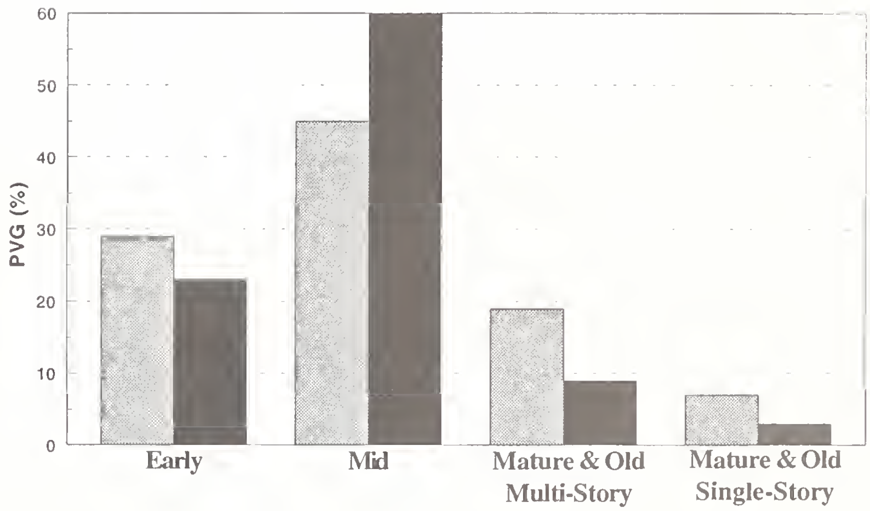


Figure 2-6. Historical and Current Seral Stages in Moist Forest PVG as Percentage of the PVG.

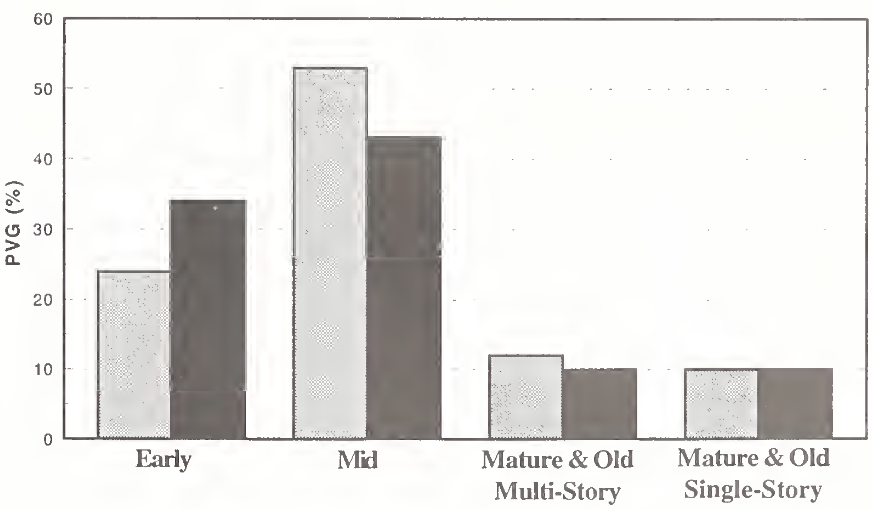


Figure 2-7. Historical and Current Seral Stages in Cold Forest PVG as Percentage of the PVG.

Historical Current

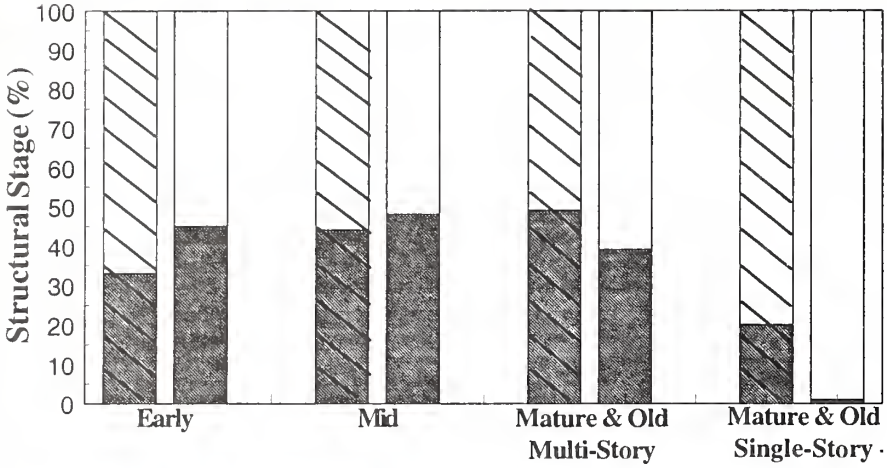
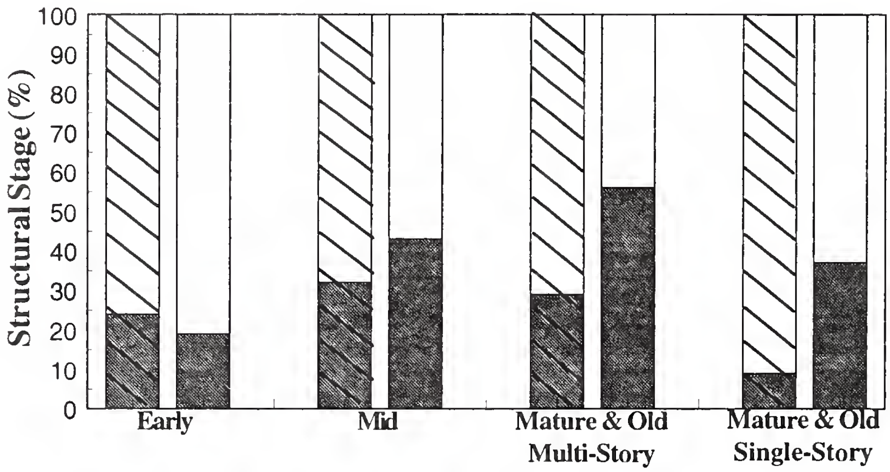


Figure 2-8. Historical and Current Shade-Tolerant and Shade-Intolerant Species in Dry Forest PVG as Percentage of the Seral Stage.

Figure 2-9. Historical and Current Shade-Tolerant and Shade-Intolerant Species in Moist Forest PVG as Percentage of the Seral Stage.



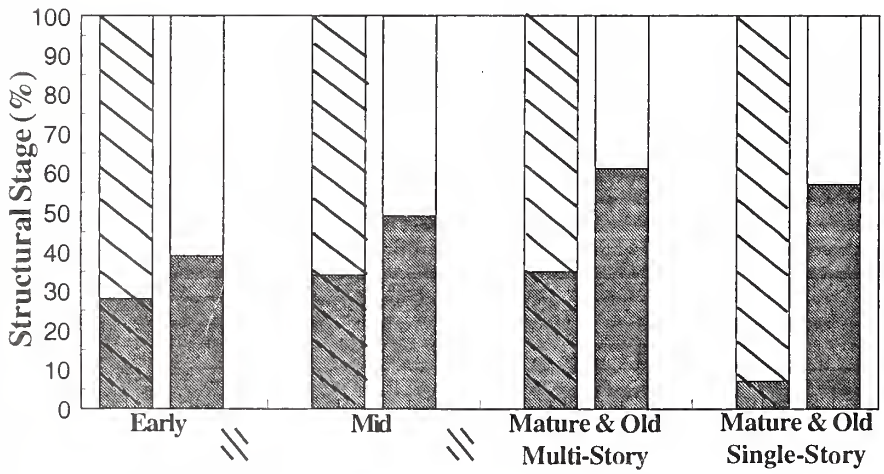
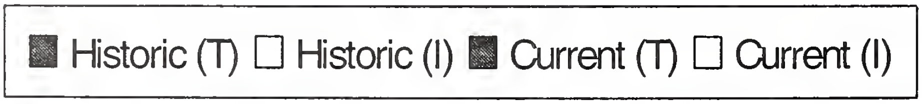


Figure 2-10. Historical and Current Shade-Tolerant and Shade-Intolerant Species in Cold Forest PVG as Percentage of the Seral Stage.



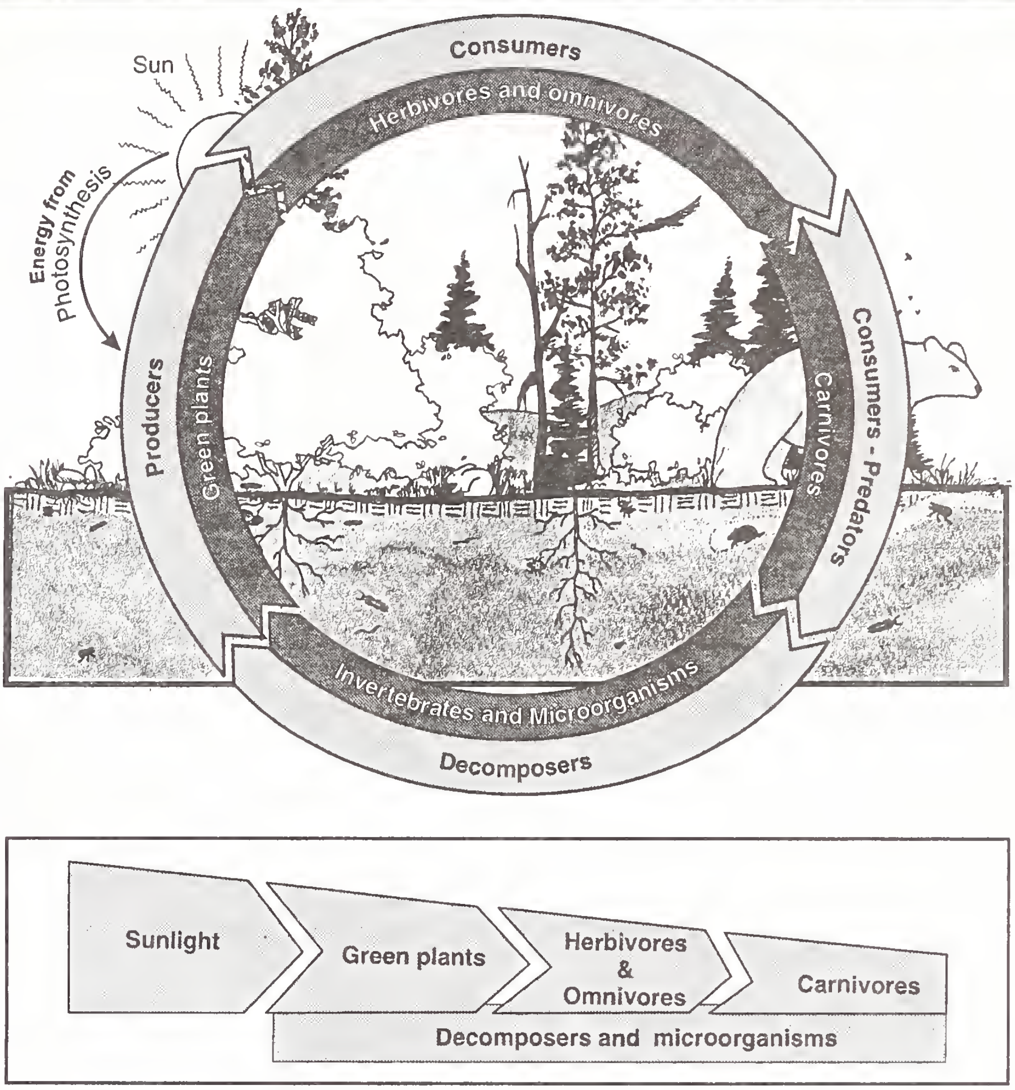


Figure 2-11. Energy Flow: Wildlife in the Food Web.

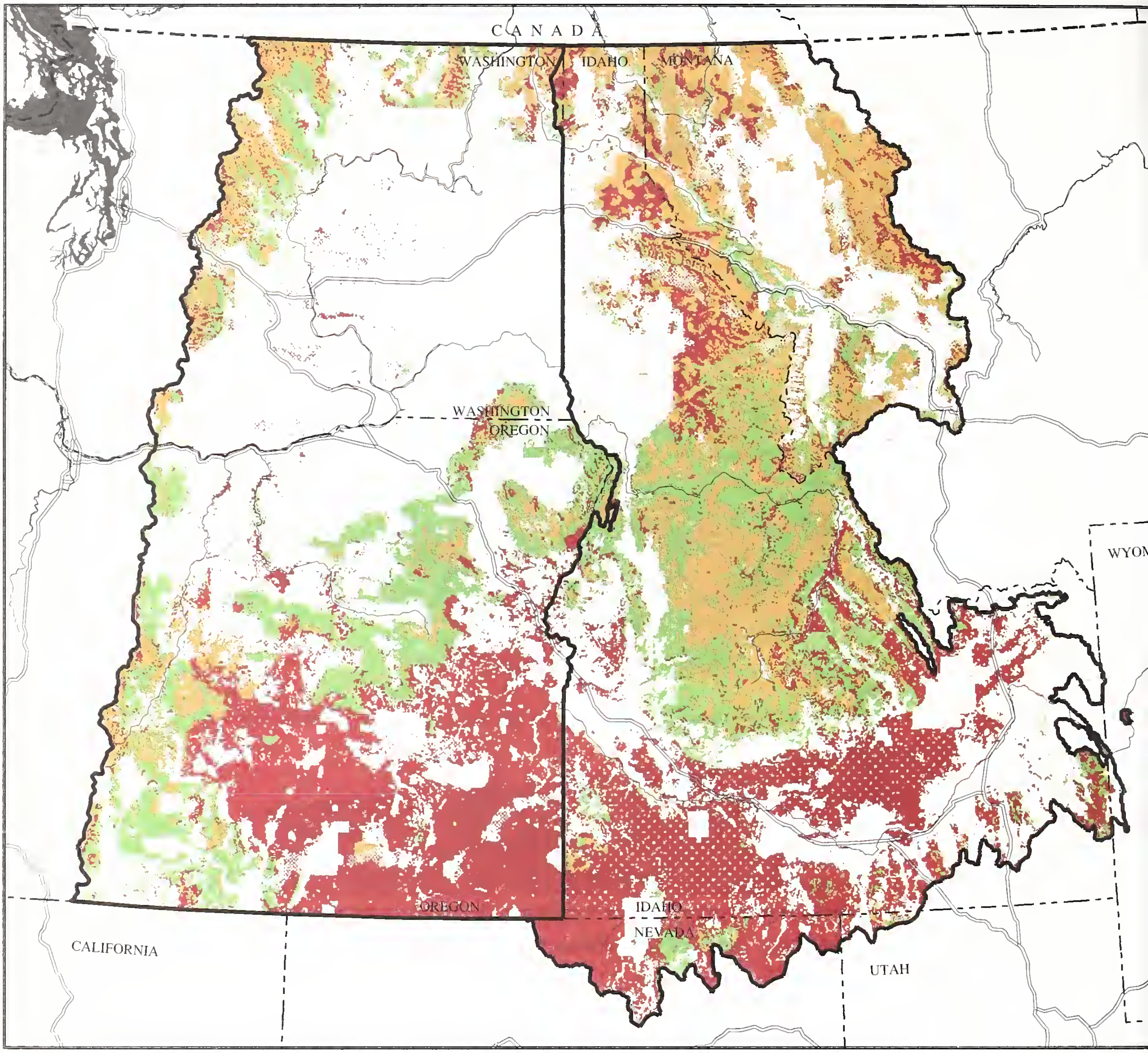
All organisms, dead or alive, are potential sources of food for other organisms. A rabbit eats a leaf, a bear eats the rabbit. . . . When the plant, the rabbit, and the bear die, they in turn are eaten by decomposers, which recycle nutrients and energy back into the system.

A series of organisms eating other organisms is called a food chain. Organisms in a natural ecosystem can be involved in complex webs of many interconnected food chains that cycle energy from the sun through producers (green plants), consumers (herbivores that eat the plants, carnivores that eat herbivores and other animals, and omnivores that eat both plants and animals), and decomposers (microorganisms), back into the environment to be used again.

Wildlife ~ ranging from insects and other invertebrates to grizzly bears and other top predators ~ are key components of all parts of the energy cycle, providing food, nutrients, and energy to each other and the system as a whole. Wildlife also contribute to the shaping of vegetation structure, composition, and density, and provide other important ecological contributions including turning over soil, pollinating flowers, dispersing seeds, and controlling pest populations of plants and animals.

Conditions and activities that change wildlife populations through modification of their habitats (positively or negatively) can affect the cycling of energy, nutrients and other ecosystem processes essential to forest and rangeland health. Such changes can also affect socio-economic health, because wildlife also contribute heavily to social and economic systems through their recreational, business, cultural, educational, and spiritual values.

Energy flow is one of the critical ecological processes in every ecosystem type. It is presented here to highlight the role of terrestrial wildlife and food webs, but energy flow is also critical in aquatic systems. Information on aquatic food webs is presented in the Fish section of this chapter.



Map 2-7.
Fire Regime Severity Historical

BLM and Forest Service Administered Lands Only

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

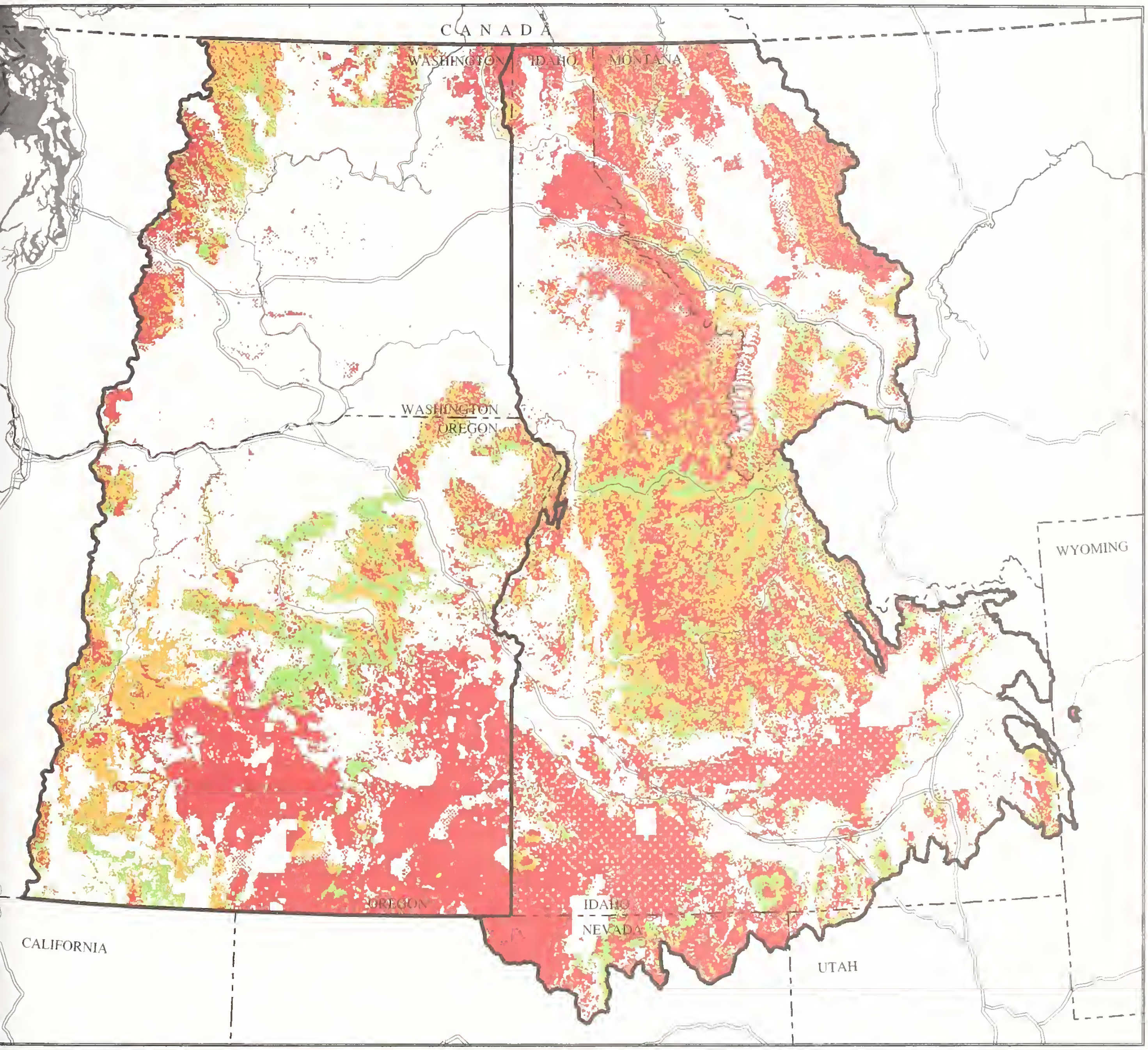
Project Area
1996

50 0 50 100 150 miles

50 0 50 100 150 km

N

Nonlethal *Major Rivers*
Mixed *Major Roads*
Lethal *EIS Area Border*



Map 2-8.
Fire Regime Severity
Current

BLM and Forest Service Administered Lands Only

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Project Area
1996

As such, they are susceptible to changes in habitat primarily associated with human activities, such as roading, traffic, recreation, logging, mining, and grazing, all of which occur in forested ecosystem PVGs. Unroaded and natural areas that are as large or larger than a species' home range (which varies by species) are important for these species. This type of habitat is especially true for those areas that connect with Canada, which provides areas of emigration to help reestablish forest carnivores and omnivores.

Species that evolved with mosaics of regeneration and old forest within their home ranges, such as the Canada lynx, now have to travel greater distances to find food and denning sites (Carnivore Report 1995). Areas with moist forests, such as the northern Glaciated Mountains, Lower and Upper Clark Fork (ERU 7, 8 , 9), have become more isolated as cover needed for travel between patches is disturbed by highways, cities, rural housing, reservoirs, or other barriers to migration. These changes are affecting large, mobile species, such as the grizzly bear, wolf, wolverine, and fisher, which have lost much of their historical range (Martin et al. 1995, and Marcot et al. in Everett et al. 1994).

Some carnivores and omnivores in northern portions of the project area ~ such as the grizzly bear, gray wolf, Canada lynx, wolverine, Pacific fisher, and American marten ~ have the opportunity to interact with populations in British Columbia and Alberta. The Northern Glaciated Mountains (ERU 7) ranges have large blocks of wilderness and unroaded lands in the moist forest and subalpine cover types that interconnect with habitat blocks in Canada. These areas have the greatest species richness of forest carnivores in the project area; however, because this is the southern portion of the larger carnivores' range, their populations are low (Martin et al. 1995). These large, mobile species have large home ranges and often run into conflicts with humans and livestock when wildlife habitat shrinks.

Woodland caribou in the project area occur only in the extreme northern Idaho and Washington, where two small populations exist (U.S. Fish & Wildlife Service Status Report 1995). Woodland caribou, moose, mountain sheep, and goats also may interact with populations in British Columbia and Alberta. Caribou inhabit Engelmann spruce/subalpine fir and western red cedar/western hemlock, mature, or old forest stands. Although woodland caribou populations have been stable, there is concern that low reproductive success, increasing predation by mountain lions, poaching, and harassment from winter recreation may drive caribou to extinction (U.S. Fish & Wildlife Service Status Report 1995).

Although not required to the same degree by each of the project area's listed wildlife species, late and old forest structure and old forests are important habitats for all. This is especially true for the bald eagle and woodland caribou. More detailed discussions of ecological niches and roles, and specific habitat requirements for listed species, can be found in the appropriate recovery plans or wolf reintroduction EIS.

Peregrine falcons need high cliffs for nesting (at least 30 feet in height) where they are secure from predators. It is important to peregrines to have good bird prey populations in areas surrounding the cliffs. Bald eagles winter in Idaho and Montana, in locations that are influenced by winter weather conditions. Wintering eagles require large hardwood or conifer trees (over 16 inches in diameter) near ice-free bodies of water that contain fish. Nesting eagles need large trees in late successional forests with low levels of human disturbance. Nest habitat is usually within one mile of water that supports fish and waterfowl. Bald eagles and a variety of other predatory birds also use large dead trees for roosting (U.S. Fish & Wildlife Service 1995).

Specific discussions of wildlife by forest PVG are found under dry, moist, and cold forest sections that follow.

Rangelands in Forested Areas: Transitory Rangelands

Rangelands in forested areas are called transitory rangelands. These rangelands are lands that are suitable for grazing use; however, because transitory range changes over time, its availability changes also. Transitory rangelands are generally associated with timber harvest activities which open up the tree canopy, but they can also be created by major fires or insect and disease events. Understory plant species suitable for grazing grow well in these newly opened areas because there is less competition for sunlight and moisture. Transitory range is found in dry, moist, and cold forest potential vegetation groups.

A portion of annual forage production for livestock comes from transitory range, particularly in heavily forested areas. Although disturbance events that help create transitory range allow forage values to increase, these values will decrease over time as numbers of trees increase and as the stand reverts to pre-disturbance levels. The rate at which trees reestablish or the overstory canopy closes is directly correlated with the longevity of transitory range.

Timber practices that maintain open canopy conditions will prolong forage production on transitory range. Available forage increases are directly related to the amounts and types of timber harvest activities. Plant palatability, forage quantity, and nutrient content all increase as plants are exposed to more moisture and sunlight after reduction of the forest canopy. Usable forage within timber harvest areas can decrease in the first few years after harvest because of downed trees, slash, and disturbance to the site from harvest and slash removal. Shrubs, forbs, and grasses may require a few years for establishment to a point where plants can be grazed successfully. Livestock may be discouraged on some sites until tree regeneration is adequate and established.

Dry Forest Potential Vegetation Group

Potential Vegetation Types (PVTs):
Dry Forest:

Dry Douglas-fir without ponderosa pine

Dry Douglas-fir with ponderosa pine

Dry grand fir/white fir

Interior ponderosa pine

Distribution and Description

The dry forest potential vegetation group currently makes up 18 percent of the ICBEMP project area and 13 percent of the UCRB planning area, with 69 percent occurring above 4,000 feet in elevation. The Forest Service or BLM administer 56 percent of dry forests in the project area (Landscape Ecology STAR 1996). In the UCRB planning area, the dry forest PVG is primarily distributed in ERUs 13 and 9, in central Idaho and western Montana (see map 2-3 in the Introduction to the Terrestrial Ecosystems section). Forest stands in dry forests are generally limited by low moisture, and are often subject to drought. Dry forest areas can also be stressed by limited nutrients if surface soils are eroded or displaced, or if tree density is high.

Historical conditions ~ The vegetation types, structural stages, and dynamics, and other conditions and processes, that are likely to have occurred around the time of pre-European settlement, approximately the mid-1800s. This time period is used only as a reference point to understand ecological processes and functions. In many cases it is neither desired nor feasible to return to actual historical ecological conditions.

Biophysical template ~ The successional and disturbance processes, landform, soil, water, and climate that formed the native system with which species of plants and animals evolved.

Composition and Structure

Tree species that make up dry forests are those that are capable of surviving in dry environments under, disturbances processes typical in dry forests. Ponderosa pine is widely distributed throughout dry forests in Idaho and western Montana. On the driest sites, ponderosa pine occurs in open, well-spaced stands with an understory of shrubs and herbaceous vegetation. On other sites, ponderosa pine occurs with a subdominant or co-dominant layer of interior Douglas-fir, white, and/or grand fir.

Quaking aspen is one of the non-coniferous trees associated with the dry forest potential vegetation group. Aspen is a deciduous tree species that occurs in relatively moist habitats within natural openings of forest stands. Non-tree vegetation of the dry forest PVG is diverse. On dry sites, shrubs are generally widely spaced in the understory beneath tree cover and are fire-tolerant and shade-intolerant. Spaces between shrubs are generally occupied by fire-tolerant and shade-intolerant grasses and forbs. On sites with dense tree cover, growth of shrubs and herbaceous plants can be limited by shade.

The dry forest PVG frequently shares lower elevation edges with grasslands, which form alternating vegetative patterns interspersed with tree-dominated stands. Between grassland and

Photo 3. Ponderosa pine forests historically were characterized as unbroken parklands of widely spaced tree clumps with a continuous understory of grasses and flowering plants. Photo by USFS

tree-dominated patches, shrubs may be dense. Shrub species in this ecotone or boundary area include: snowbrush, mallow ninebark, common snowberry, antelope bitterbrush, and kinnikinnik. Herbaceous species throughout the dry forest PVG include: elk sedge, Wheeler's bluegrass, cat's ear mariposa lily, harsh paintbrush, silky lupine and few-flowered pea.

Historical Conditions

When European settlement began, ponderosa pine forests could be characterized as unbroken parklands of widely spaced tree clumps with a continuous understory of grass and flowering plants. These forests were fairly extensive and experienced frequent low-intensity surface fires because of the presence of highly combustible leaf litter and cured herbaceous vegetation, along with a long season of favorable burning weather. Most stands were open and park-like, with uneven-aged stands dominated by old fire-resistant trees. Shrubs, understory trees, and downed logs were sparse. Undergrowth was primarily fire-resistant grasses and forbs, which resprouted after each fire. Pine regeneration occurred where the death of overstory trees created small openings. Sometimes seedlings grew fast enough to gain adequate resistance to survive the next fire. In most of the dry forest PVG, fire maintained the dominance of ponderosa pine by killing the more fire-sensitive seedlings and saplings of Douglas-fir, grand fir, and white fir that may have established (Arno 1995).

Historically, 91 percent of the forest would sustain nonlethal underburns, with over half of those at intervals of less than 25 years, in which the dominant fire-tolerant (shade-intolerant) overstory survived but regeneration and fire-intolerant (shade-tolerant) species often were killed. Only about one percent of the area had mixed severity fires that killed some dominant overstory trees, and about eight percent of the area had a lethal, stand-replacing fire regime. Fires lethal to the overstory usually occurred in steep or windy areas where fire would easily carry into the canopy, or on low productivity sites where trees did not grow tall enough between fires to resist flames.

Current Conditions and Trends: Departures in Composition, Structure, and Disturbance Processes and Patterns

Departures in Composition and Structure

The composition, structure, and disturbance patterns in dry forests have changed significantly through timber harvesting, fire suppression, and/or livestock grazing, even though the actual loss of the PVG from historical amounts has been slight. Human-caused disturbances have been more pronounced in the dry forest potential vegetation group than in the moist or cold forest groups. This is partly because dry forests are more accessible to housing development, logging, and grazing. Dry forests also contained tree

Photo 3a. Dry forests currently have ponderosa pine being replaced by Douglas-fir and grand fir/white fir. Photo by Doug Basford.

species historically favored by the timber market (Everett et al. 1994).

There are currently 25 percent more young tree stands than there were historically. However, these types of stands are most often created by harvesting and are missing the scattered large live and dead trees that would have been present if a fire had initiated the stand (Landscape Ecology STAR 1996). Ponderosa pine has been replaced by grand fir and white fir on 19 percent of its range, and by interior Douglas-fir on another 20 percent of its range. The old single story stage of ponderosa pine is at 25 percent or less than its historical amount. On the other hand, the old multi-story stage of Douglas-fir, grand fir, and white fir is approximately three times its historical amount, while the young forest structural stages of Douglas-fir, grand fir, and white fir are nearly double their historical amounts.

Currently, 30 percent of stands within dry forests are dominated by shade-tolerant species, or more than twice the amount that existed in the early 1800s (Landscape Ecology STAR 1996).

The clumpy character of historical stands that was created by fire has changed. Overall, stand structures changed from open park-like stands of large trees with clumps of small trees, to dense overstocked young stands with several canopy layers (Caraher et al. 1992, Gast et al. 1991 in Lehmkuhl et al. 1994). Landscapes once dominated by shade-intolerant species are nearly double their historical level.

Maps 2-9 and 2-10 show the historical and current distributions of tree species within the dry forest PVG.

Departures in Fire Regimes

Important changes have occurred in most of the dry forest PVG since 1900 due to interruption of frequent burning. Reduced fire occurrence began in the late 1800s as a result of the following: (1) relocation of American Indians; (2) fuel removal by heavy grazing of livestock; (3) disruption of fuel continuity on the landscape due to irrigation, cultivation, and development; and (4) adoption of fire exclusion as a policy. The general result has been development of dense conifer understories beneath old stands and thickets of small trees where the overstory has been removed. In many stands, duff mounds 6 to 24 inches deep have accumulated under old trees, and burning these mounds can girdle and kill the trees.

Lack of frequent nonlethal underburns has resulted in an increase in fuel loading, duff depth, and stand density, and a fuel ladder that can carry fire from the surface into the tree crowns. Levels of carbon and nutrients tied up in woody material are higher than they were historically (figure 2-12). The increase in fire intervals, without equivalent fuel reductions, has resulted in much higher fireline intensities and fuel consumption when fires do occur. This causes much higher mortality of the dominant overstory trees, as well as higher potential for soil heating and death of tree roots and other understory plants.

About 39 percent of acres currently have the potential to sustain nonlethal underburns, but they occur at frequencies greater than 76 years. Currently about 36 percent of the area has a mixed severity regime, most ranging in

occurrence between 76 to 150 years. Lethal stand-replacing fires occur on about one-quarter of the area, at a rate three times greater than historically. About 60 percent of the area that used to burn with nonlethal fires now has a mixed severity or lethal stand-replacing fire regime. (See maps 2-7 and 2-8, and table 2-8.)

Fire exclusion effects have been greatest in the most heavily roaded areas where suppression has been successful. Development of residential areas and other cultural facilities in forests of the UCRB has been most common in this PVG, which, coupled with the changed fire regime, has caused a greatly increased risk to life and property (see Human Uses and Values section for additional discussion).

Human Disturbance

In general, forests showing the most change are those that have been roaded and harvested. Large trees of high-value species, such as ponderosa pine, were selectively logged. True firs, Douglas-fir, and lodgepole pine were left in stands either because these species were not desirable on the timber market or because they were smaller trees and could not be processed efficiently. The remaining trees, which were not always the best genetic stock, provided seeds for the next generation of forest. Exclusion of fires and availability of seeds allowed shade-tolerant trees to replace open, park-like stands with dense stands of trees. These dense stands did not receive the thinning treatment of frequent fires, resulting in competition for sunlight and nutrients. These stands now exhibit changes in forest health including a loss of growth potential due to overstocking, greater risk of severe insect and disease problems, greater risk of high severity fires, and a loss of habitat diversity in the forested site when compared to historical conditions.

The dry forest PVG is particularly vulnerable to the introduction of exotic species (noxious weeds). Noxious weeds such as knapweed are rapidly displacing native species in some places.

Insects and Disease

The insect and disease relationship as it relates to forest health in dry forests has changed as forest structure has changed. Insects and diseases always existed in forests, but the size and intensity of their attacks have increased in recent years (Caraher et al. 1992, Gast et al. 1991 in Lehmkuhl et al. 1994). With the exclusion of fire, stand densities are often much greater, and species composition has changed to dominance by trees such as Douglas-fir, grand fir, and white fir. The younger forest structure or multi-layered structure comprised of a high proportion of shade-tolerant species is highly

Table 2-8. Changes in Fire Regimes in the Dry Forest PVG, in Percent of UCRB Planning Area, FS-/BLM-Administered Lands.

Fire Regime Class	Historical Percent	Current Percent
Nonlethal underburns, very frequent (<25 years)	47.5	0.1
Nonlethal underburns, frequent (26–75 years)	23.1	0.1
Nonlethal underburns, infrequent (76–150 years)	20.0	38.4
Nonlethal Underburns	**90.6**	**38.6**
Mixed severity, frequent (26–75 years)	1.3	8.7
Mixed severity, infrequent (76–150 years)	0.1	27.0
Mixed severity, very infrequent (151–300 years)	0	0
Mixed Severity	**1.4**	**35.8**
Lethal, stand-replacing, frequent (26–75 years)	5.8	0.2
Lethal, stand-replacing, infrequent (76–150 years)	2.2	25.4
Lethal, stand-replacing, very infrequent (151–300 years)	0	0
Lethal, Stand-Replacing	**8.0**	**25.6**

Source: ICBEMP GIS Data (1KM² raster data)

susceptible to large-scale infestations of insects and disease. Overstocked stands result in moisture stress in the normal summer drought period, and make stands highly susceptible to bark beetles. Bark beetles currently often replace fire in eliminating trees growing in excess of site potential.

Susceptibility to the Douglas-fir beetle has increased in the Blue Mountains, Lower Clark Fork, and Snake Headwaters ERUs. This was attributed to increased contagious spread of shade-tolerant Douglas-fir, increased abundance of host trees of adequate size for successful bark beetle breeding, increased patch densities and layering of canopies, and increased landscape contiguity of susceptible areas. Susceptibility to fir engraver beetle increased in the Central Idaho Mountains and Upper Clark Fork ERUs and declined in the Blue Mountains ERU. While grand fir and white fir have increased in area in the Blue Mountains, that increase is occurring in the understories of multi-layered patches. Timber harvest and fir engraver mortality of productive grand fir and white fir patches have contributed to the precipitous decline in that cover type in the Blue Mountains ERU.

Susceptibility to defoliators (needle-eating insects) such as western spruce budworm and Douglas-fir tussock moth has increased in several ERUs and declined in none. The increased susceptibility was attributed to increases in shade-tolerant Douglas-fir, grand fir, and white fir and the increased density and layering of canopies. These insects have been active in all ERUs in the UCRB planning area.

Areas susceptible to Douglas-fir dwarf mistletoe increased in the Blue Mountains and Snake Headwaters ERUs and declined in the Upper Clark Fork ERUs. Increasing susceptibility was associated with increased abundance of Douglas-fir, increased canopy layering, and Douglas-fir encroachment on dry and relatively moist sites that historically had frequent understory fires. Areas susceptible to ponderosa pine dwarf mistletoe decreased with the declining area in the ponderosa pine cover type in the Blue Mountains and Northern Glaciated Mountains ERUs.

Susceptibility of dry forests to Armillaria root disease, laminated root rot, and S-group annosum root disease is similar to that described in the moist forest potential vegetation group, later in this section.

The increasing number of small dead trees in stands attacked by insects and diseases makes forests even more susceptible to large high-intensity fires. The stands that are most susceptible to moisture stress, insects, and disease tend to be those at the lowest elevations, which typically border private, State, tribal, or other land ownerships. Homes, private, tribal, and State forest resources, wildlife winter ranges, and other important resources are increasingly at risk from fire and insect and disease attack from lands administered by the BLM and Forest Service (Everett et al. 1994).

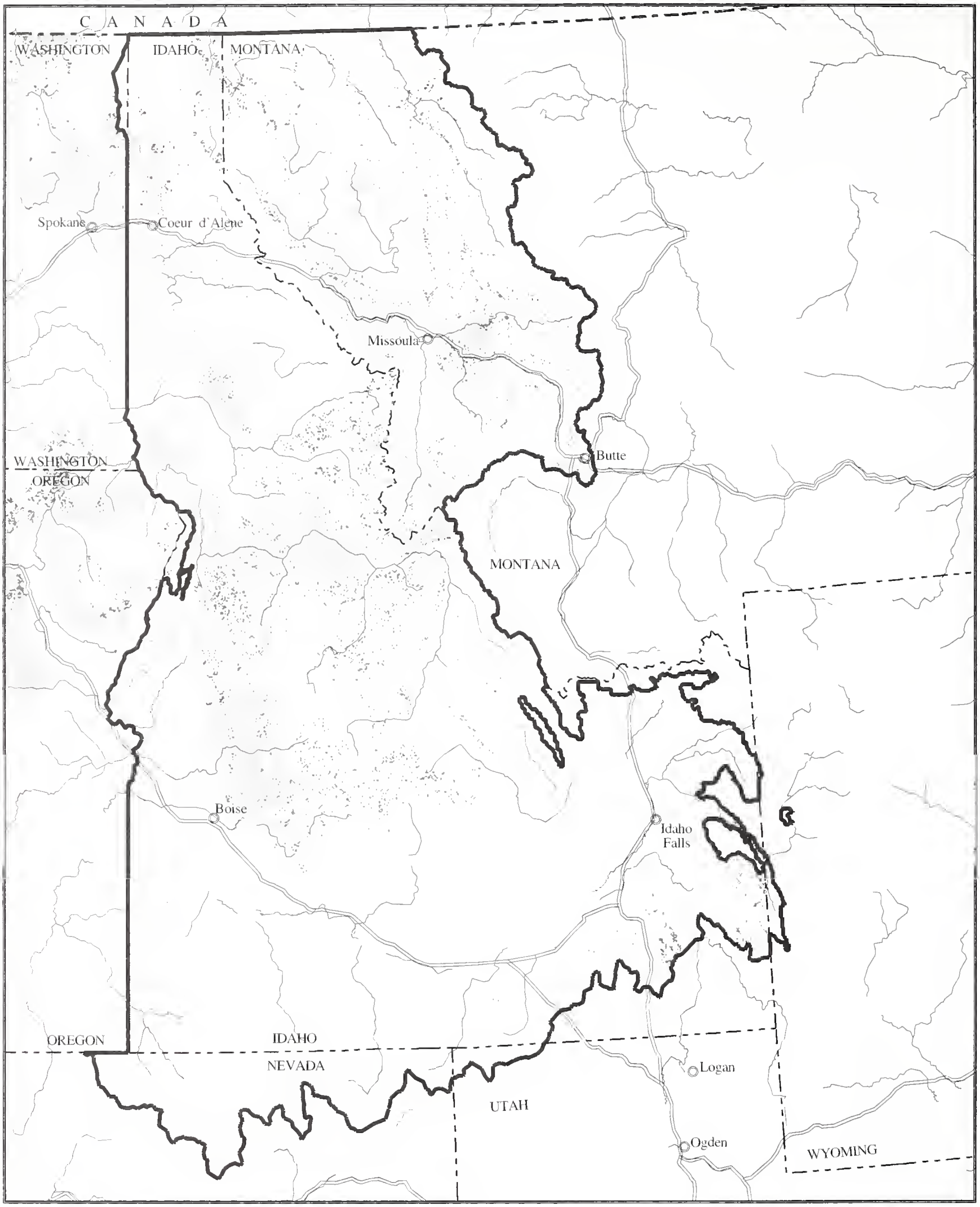
Terrestrial Species and Habitats in Dry Forests

General Trends

Species that evolved in dry forest environments adapted to changes brought on by frequent disturbances. They did so by shifting within the environment and using the mosaic of habitats and microsites (small habitat areas) created by fires and other events (Collopy and Smith 1995).

For the most part, species associated with the dry forest potential vegetation group have undergone the most change in habitat conditions over time. Habitat patches that were once large areas of pine forests are now much smaller, which makes it more difficult for animals to move to other patches of similar habitat (Collopy and Smith 1995, Everett et al. 1994). Fragmentation and loss of connection of similar habitat means that some animals have to travel farther to find suitable habitat. Some animals are limited in how far they can travel, and those that travel are more vulnerable to predators and mortality from traffic and other hazards. Fragmentation has increased isolation of different wildlife populations and limited genetic interchange between populations. Some areas were identified in the Terrestrial STAR (1996) as having several species with very limited distribution (narrow endemics); (see map 2-5, in Introduction to Terrestrial Ecosystems section). These species are especially vulnerable to local disturbance events that can endanger an entire population or species.

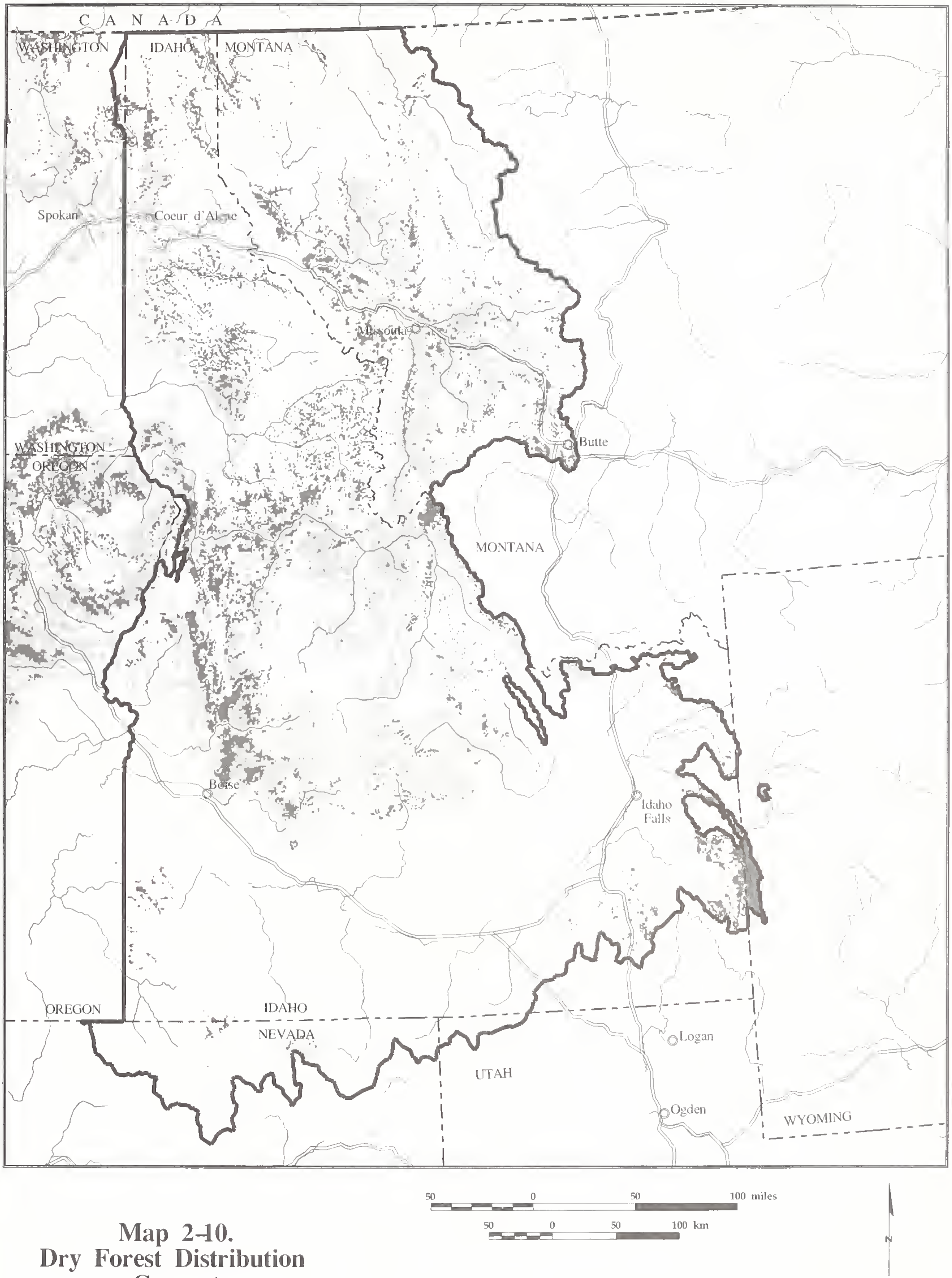
Species associated with late-successional forest and old open ponderosa pine were likely affected the most by changes in habitat conditions that occurred in dry forests over the past 100 years (Terrestrial and Landscape Ecology STARs 1996). There also has been a decline in large snags and



Map 2-9. Dry Forest Distribution Historical

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Draft UCRB EIS
1996



**Map 2-10.
Dry Forest Distribution
Current**

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

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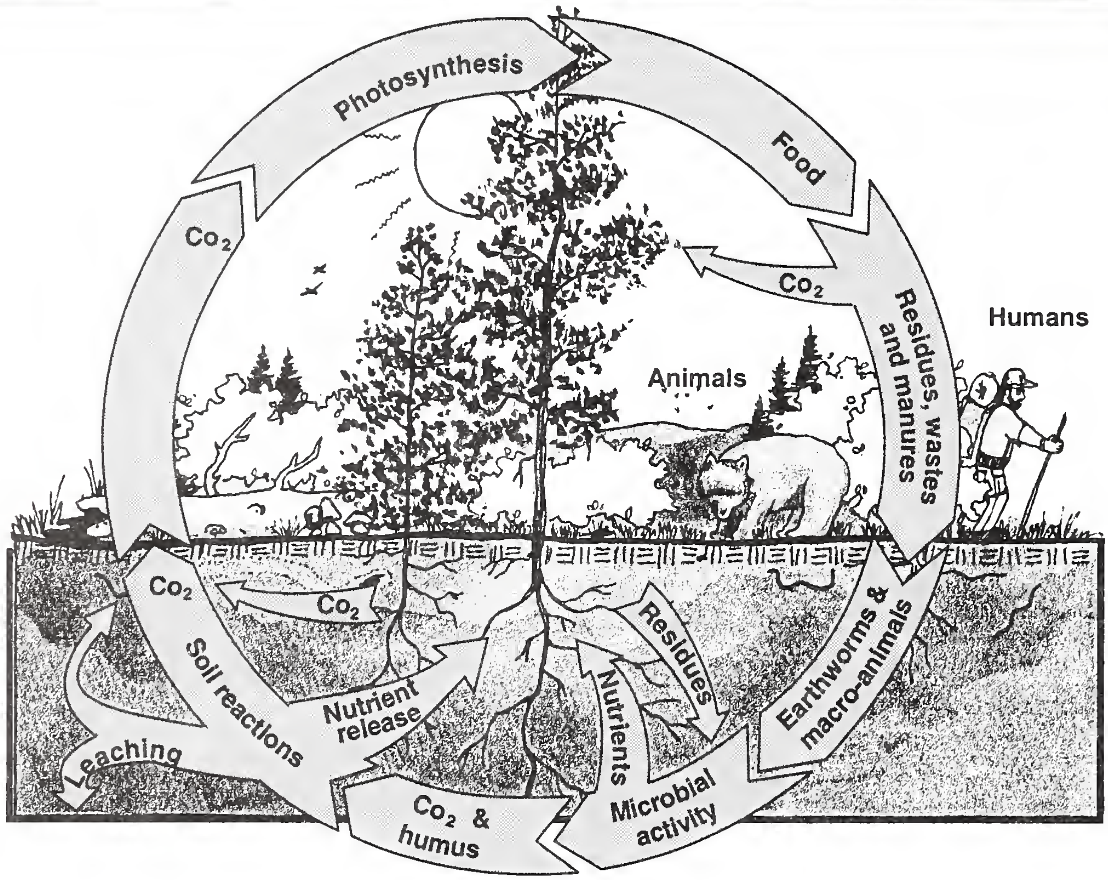


Figure 2-12. Carbon cycle and Forest Health.

A key ecological component of ecosystem health is effective cycling of energy and materials. One such cycle of particular importance in the coniferous forests of the UCRB is the carbon cycle. Carbon - the key building block in all living cells - is captured primarily through photosynthesis and stored in the form of needles, leaves, stems, twigs, branches, bark, roots, and wood fiber in trees and understory plants. Carbon can also be diverted below ground to support soil organisms and processes. Carbon is recycled through the combined processes of fire and microbial decomposition.

Historically, disturbances such as fire, insects, and disease regulated processes important to carbon cycling within forest ecosystems. Fungal disease and some insects shortened nutrient cycles or accelerated decomposition. Frequent low-intensity fires prevented build-up of carbon and nutrients in woody biomass and litter and duff layers. This was especially true for warm, dry sites characterized by ponderosa pine/Douglas-fir and ponderosa pine/western larch forests.

Without fire, carbon accumulates to levels that are higher than would have occurred historically in many places. In the UCRB, more carbon is now being accumulated and stored in denser stands of shade-tolerant, non-fire-adapted species. Insect and disease disturbance has increased and has begun to play a larger role in carbon recycling. As tree mortality increases, more carbon and nutrients are tied up in standing and downed dead woody material and in deep organic layers on the ground. Soil properties and soil-vegetation relationships also have been affected since many beneficial soil organisms depend on living trees to fuel their activities.

These changes to the carbon cycle set the stage for widespread extreme wildfire events that result in an excessive loss of carbon being released all at once and that jeopardize associated ecosystem components and functions.

Carbon and other nutrient and biophysical cycles are key ecological processes in every ecosystem type and are inextricably woven together through and across ecosystem boundaries. The carbon cycle is discussed here to highlight its importance to forest health, it also is critical to rangeland and riparian/aquatic ecosystem health.

downed logs, especially where firewood gathering and salvage logging has occurred. Most of the snag-dependent birds and small mammals are insectivorous and may play a role in regulation of insect populations. Snag-dependent species tend to increase along with the number of snags until other factors become limiting. Snag diameter and height and downed log quantity and size are important criteria for selection by snag-dependent species (Thomas et al. 1979, Torgersen and Bull 1995).

The diversity of habitat created by mosaic fire patterns is rarely present in more uniform logging units of unburned stands. Increased density of trees in dry forest stands in all structural stages has limited light, moisture, and nutrients available to understory plants and animals. Dense stands retard the ability of forests to produce large trees and snags for future habitat (Landscape Ecology STAR 1996, Collopy and Smith 1995, Henjum et al. 1994).

Animals that are most vulnerable to changes in habitat are those that depend on a narrow range of habitats, and those that are not very mobile. Mobile species and animals that use a variety of habitats can move into other habitats types or patches when disturbance occurs (Terrestrial STAR 1996). Coyotes, deer mice, robins, big brown bats, black widow spiders, and house wrens have all adapted to unique habitats created in people's backyards, where dry forests often once stood. Changes in disturbance patterns and created habitats have allowed exotic plant and animal species, such as spotted knapweed, musk thistle, starlings, and bull frogs to invade dry forests and compete with native species. Logging, road construction, seeding of exotic grasses andforbs, and other disturbances often create opportunities for domestic livestock to graze in forested habitats, which may further spread exotic species and may compete with native wildlife for forage.

The decline in open, single-storied mature pine and larch stands has reduced habitat for the olive-sided flycatcher and Lewis's woodpecker, both of which have shown declines in the past 25 years (Saab 1995). Species closely associated with old forest stages such as the Lewis and Pileated woodpeckers and the Williamson's sapsucker are believed to have decreased because of the reduction of old forest stages (Terrestrial STAR 1996). The Townsend's big-eared bat, California myotis bat, and fringed myotis bat are believed to be affected by this same loss of large trees for roosting. These species may help control insect populations which in turn influence tree survival. The Terrestrial STAR (1996) concluded that one tree bole feeder, five bark beetles, and 22 defoliating insects can alter plant succession and create new vegetation patterns. The decline in insect-eating birds and bats due to the change in old forest structure can have dramatic effects on structure, energy flow, nutrient cycling, and soil productivity of future forests.

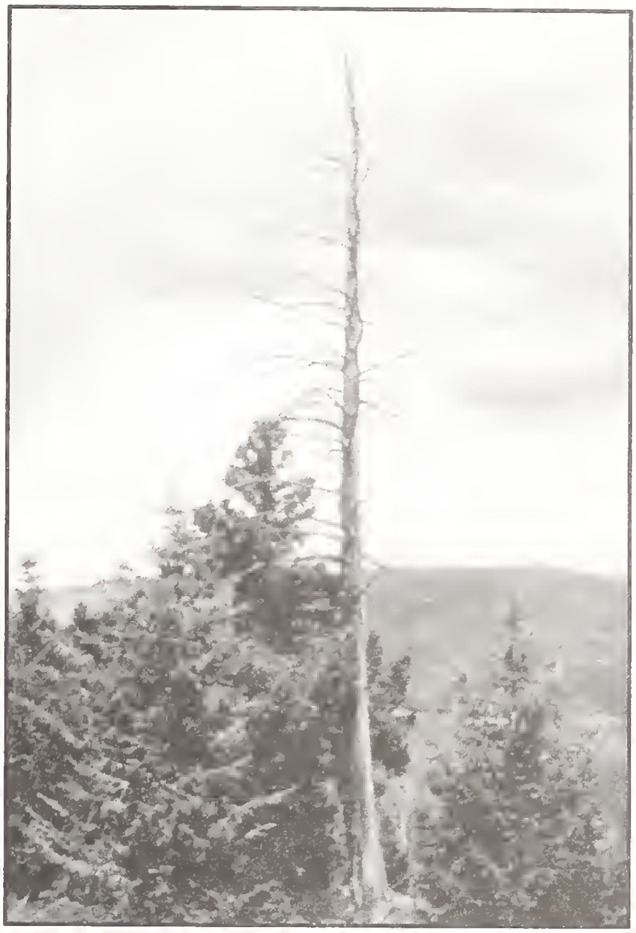


Photo 4: Snags or standing dead trees have declined, with implications for wildlife species that depend on snags for habitat. Photo by Doug Basford.

Roads, especially interestate highways or other milti-laned high-traffic roads, present barriers to carnivores and other species. While the situation may be infrequent, it causes major problems where it occurs.

Invertebrates

Historically, the variety of tree species in dry forests was relatively low and patch sizes were relatively large, allowing invertebrates (species with no backbone) to distribute across a broad area. Insects sometimes play an important role, in concert with drought and fire, in shaping stand and landscape structure. Invertebrates perform vital functions in the forest by decomposing wood and litter that return nutrients to the energy cycle, and by serving as food for all other groups of animals. Other important Key Ecological Functions of invertebrates include turning over soil and increasing its productivity, pollinating flowers, and dispersing seeds (Terrestrial STAR 1996).

Invertebrates use a variety of habitat patches and microsites in forests that appear uniform. Tree canopies, downed wood material, snags, flowers, forest floor litter, and soils are important habitats for invertebrates and are considered Key Environmental Correlates in the Terrestrial Staff Area Report (1996). Many unique and some rare or endemic species (species with very limited distribution) of invertebrates depend upon talus, caves, bogs, springs, gravel, and other forest habitat features which also are Key Environmental Correlates. Even after fires, islands of unburned trees and litter and large trees with thick bark provide places for insects and other invertebrates to survive and recolonize the area.

Dense stocking of stands due to fire exclusion has reduced the amount of light to the forest floor, which has reduced understory vegetation, temperature, and decomposition rate and nature of woody debris for invertebrates. Within burned areas, mosaic patterns of habitat and unburned islands of vegetation have decreased. This limits the distribution of less mobile species of invertebrates, such as snails, and may limit recolonization of disturbed areas with invertebrate species (Terrestrial STAR 1996). Increased compaction and soil displacement during logging, grazing, and other activities have reduced habitat effectiveness for some soil invertebrates, such as earthworms, nematodes, and bacteria, and may influence long-term site productivity.

Amphibians

Many salamanders and frogs use downed wood, talus, and trees, but riparian areas and wetlands habitat within dry forests are Key Environmental Correlates for amphibians. The Terrestrial Staff database for the area contains seven frogs, two toads, one newt, and four salamanders in the forest potential vegetation groups. Key Ecological Functions of amphibians include helping to control insects, turning over soils, creating burrows for other species, and indicating water quality and quantity (Terrestrial STAR 1996).

Many salamander and frog populations are vulnerable because of changes or reductions in available riparian habitats brought on by logging and grazing, predation by exotic fish and exotic bull frogs, changes in invertebrate populations, and potential climate changes. The tiger salamander is used as live bait and has shown an increase in distribution, probably due to releases during fishing. The spotted frog has declined in southern Idaho, likely due to conversion of wetlands to agriculture and development of springs. The western toad is also declining in some parts of its range due to dam and spring developments in dry forest streams and seeps (Terrestrial STAR 1996).

Reptiles

Reptile distribution is influenced more by climate and terrain than by vegetation type or structure. There are two turtles, one lizard, one skink, and few snakes known that may occur at lower elevation forested sites. Most reptiles are restricted to open areas and lowlands because, as cold-blooded animals, they need warmer temperatures and rocky talus habitats; cooler temperatures at higher elevations limit their ability to regulate body temperature. Key Ecological Functions of reptiles include helping to control rodents and insects (on and below the ground surface), providing food for birds and mammals, and providing burrows for other animals (Terrestrial STAR 1996).

Reptiles are highly susceptible to changes in climate and microsite, especially in forested ecosystems, which are at the upper elevation end of their range. Downed logs, talus, and rocks are important habitat features that have been altered in some locations because of road construction. Changes in populations of invertebrates and small mammals also limits prey for some reptiles. The increased stocking density of dry forest stands provides more shade, which may be reducing habitat quality for reptiles. The common garter snake is widespread, but appears to be declining, especially in southeastern Idaho (Terrestrial STAR 1996).

Birds

Birds use all the structural stages of dry forests, from young stands and brushy openings to old forests and dead trees and logs. The presence of riparian vegetation within the forest brings in additional bird species, such as many ducks and shore birds, with some stopping only during migration (Collopy and Smith 1995). The Terrestrial Staff database lists 118 bird species that use at least some aspects of dry forests. Federally listed species that use dry forest in the planning area include the threatened bald eagle, which needs large trees for nesting and roosting, and the endangered peregrine falcon, which uses cliff habitat to nest while it preys on birds in open stands of trees in dry and other forests.

At least 11 species of woodpeckers rely on dead trees for excavation of nesting holes. A Key Ecological Function of woodpeckers is the excavation of holes that are important for many other birds and mammals that need holes for nesting but cannot excavate their own. Fourteen other species of birds use pre-excavated cavities in standing dead trees (snags). Different species of woodpeckers select different habitats, with some using trees over 16 inches in diameter, some using smaller trees, and others needing clumps of dead trees or trees of different heights. Woodpeckers, and other birds and bats that use woodpecker holes, are very important for controlling insect outbreaks and for bird watching for the interested public (Terrestrial STAR 1996, Thomas et al. 1979).

Birds with large wing-spans, such as some hawks and owls, hunt for food in openings or in open stands of trees. The tight spacing of trees in dense stands makes it difficult for them to fly between trees, and may limit populations of some prey species. Goshawks use large trees in older stands of mixed conifers, pine, Douglas-fir, lodgepole pine and aspen to nest; they also need mixed old and young forest structures with water in areas surrounding the nest for feeding and fledging of young birds (Thomas et al. 1979, Schommer and Silivsky 1994).

The decline in large trees affects nesting and roosting habitat for birds. It is believed that a decline in nesting sites and foraging areas for the goshawk, Vaux's swift, pileated woodpecker, white headed woodpecker, and flammulated owl has occurred. No quantitative data is available to compare population trends of these species from a few decades ago (Collopy and Smith 1995). The Olive-sided Flycatcher is the only old forest species with sufficient sampling to show a long-term decline in population (Collopy and Smith 1995, Terrestrial STAR 1996). Several species that use medium to small dead trees with pre-excavated cavities ~ such as the northern flicker, tree swallow, violet-green swallow, house wren, and mountain bluebird ~ show increasing population trends. This may be correlated with the recent increase in insect and disease outbreaks and fires in densely-stocked stands that has created an abundance of small dead tress (Collopy and Smith 1995). White-headed woodpeckers and flammulated owls are among the species associated with old single story ponderosa pine. Because of loss and changes in this type of habitat, these species are believed to have declined and are considered Sensitive by Federal agencies (Terrestrial STAR 1996).

Photo 5. Woodpeckers excavate holes that are important for many other birds and mammals. Photo by Doug Basford.

Brown-headed cowbirds, which are nest parasites on other birds, have increased. Species that use shrubby riparian areas and young forests increased (western wood-peewee, dusky flycatcher, northern oriole, lazuli bunting, and warbling vireo); (Collopy and Smith 1995). The reasons these species have increased are not completely understood (Terrestrial STAR 1996).

Mammals

The Terrestrial database lists 70 species of mammals in dry forests. Mammals use a wide variety of habitats, including burrows below the surface, litter, downed logs, rock outcrops, openings, young forests with or without shrubs, and middle, late, and old forests. Many squirrels, mice, woodrats, and other species rely on seeds from trees, especially large ponderosa pine seeds. Some chipmunks and other small mammals use young and dense stands because they prefer the jumble of logs and canopy cover that protects them from predation. Mule deer and elk rest, hide, and forage in tree or brush stands, but dense stands of trees often have too much shade to provide shrubs, grass, and forbs needed for food (Lyon et al. 1995). Desert and mountain bighorn sheep avoid dense stands of trees or shrubs where food (grass and forbs) is limited, sight distances are short, and sheep are more vulnerable to predators.

Thirteen species of bats use thick barked trees, especially large ponderosa pine or western larch, for roosting. Old buildings, bridges, caves, mines, tree cavities, and other small openings are also used by bats for roosting. Bats prey on a variety of insects and may help control insect outbreaks in dry forests (Terrestrial STAR 1996).

Some mammals, such as the pocket gopher, porcupine, and mountain beaver, have benefitted from clearcut logging and plantations. As these species increased, carnivores that help control them ~ such as the fisher, marten, mink, and goshawk ~ decreased, probably because of trapping, predator control, and habitat changes (Terrestrial STAR 1996). As a consequence, animal-related tree damage in plantations has increased. Conversion of open stands of pines to densely stocked, mixed species forests has benefitted some squirrels, but the loss of understory vegetation and habitat mosaics may be affecting other species, such as the mountain cottontail and pygmy shrew. These small forest mammals are important food for hawks, owls, eagles, and other carnivores, and they help transport and plant seeds.

Historical accounts are not conclusive, but it appears that elk and white-tailed deer populations in the dry forest potential vegetation group are higher than they were before European settlement. Elk and white-tailed deer have expanded their ranges in recent times, providing increased hunting opportunities but also causing potential damage in the rural and agricultural interface on private lands. In some forest settings, elk and deer are using dense stands of shade-tolerant understory trees for cover, which they would not have used as extensively under natural fire regimes. Open road density is high

Photo 6. Deer are among the wildlife that use stands of trees for cover in winter. Photo by USFS.

in the dry forest potential vegetation group, due to the gentler terrain, emphasis on timber harvest, and proximity to human habitation. People using highly roaded areas are the single biggest threat to big game populations, making them vulnerable to poaching, stress, hunting, accidents, and displacement (Lyon et al. 1995).

Bighorn sheep are also popular for hunting and viewing. While some populations are maintaining current numbers, other populations are generally declining due to widespread habitat changes, such as replacement of grass, forbs, and low shrubs with tall shrubs and trees, which bighorns avoid due to increased predation. Fire exclusion and grazing of domestic livestock make contributions to these habitat changes (Lyon et al. 1995).

Moist Forest Potential Vegetation Group

Potential Vegetation Types (PVTs):
Moist Forest

Cedar/hemlock-Inland
Moist Douglas-fir
Grand fir/white fir-Inland
Spruce-fir, wet

Distribution and Description

The moist forest potential vegetation group includes transitional areas between drier, lower elevation forest or woodland types in dry forests, and higher elevation subalpine forest types in cold forests (Agee 1993). Approximately 40 percent of the moist forest potential vegetation group in the project area occurs at elevations less than 4,000 feet. Moist forests cover approximately 18 percent of the project area and 29 percent of the UCRB planning area; 64 percent of that is administered by either the Forest Service or BLM (Landscape Ecology STAR 1996). In the UCRB planning area, the moist forest PVG is primarily distributed in ERUs 7 and 8 and the northern part of ERU 13 (see map 2-3 in the Introduction to Terrestrial Ecosystems).

Moist forests typically have relatively high soil moisture in the spring and early summer, followed by drought stress in the late summer and early fall. Available nutrients in the soil can limit productivity, particularly on sites where harvest practices have caused soil loss or have removed a large proportion of wood, litter, duff, and small branches that contain the bulk of site nutrients. Tree growth rates are generally rapid, and young forests develop relatively quickly into middle-aged stands. This PVG has a productive environment which rapidly produces biomass and accumulates fuels; insects and pathogens are potentially very active.

Maps 2-10a and 2-10b show the historical and current distributions of tree species within the moist forest PVG.

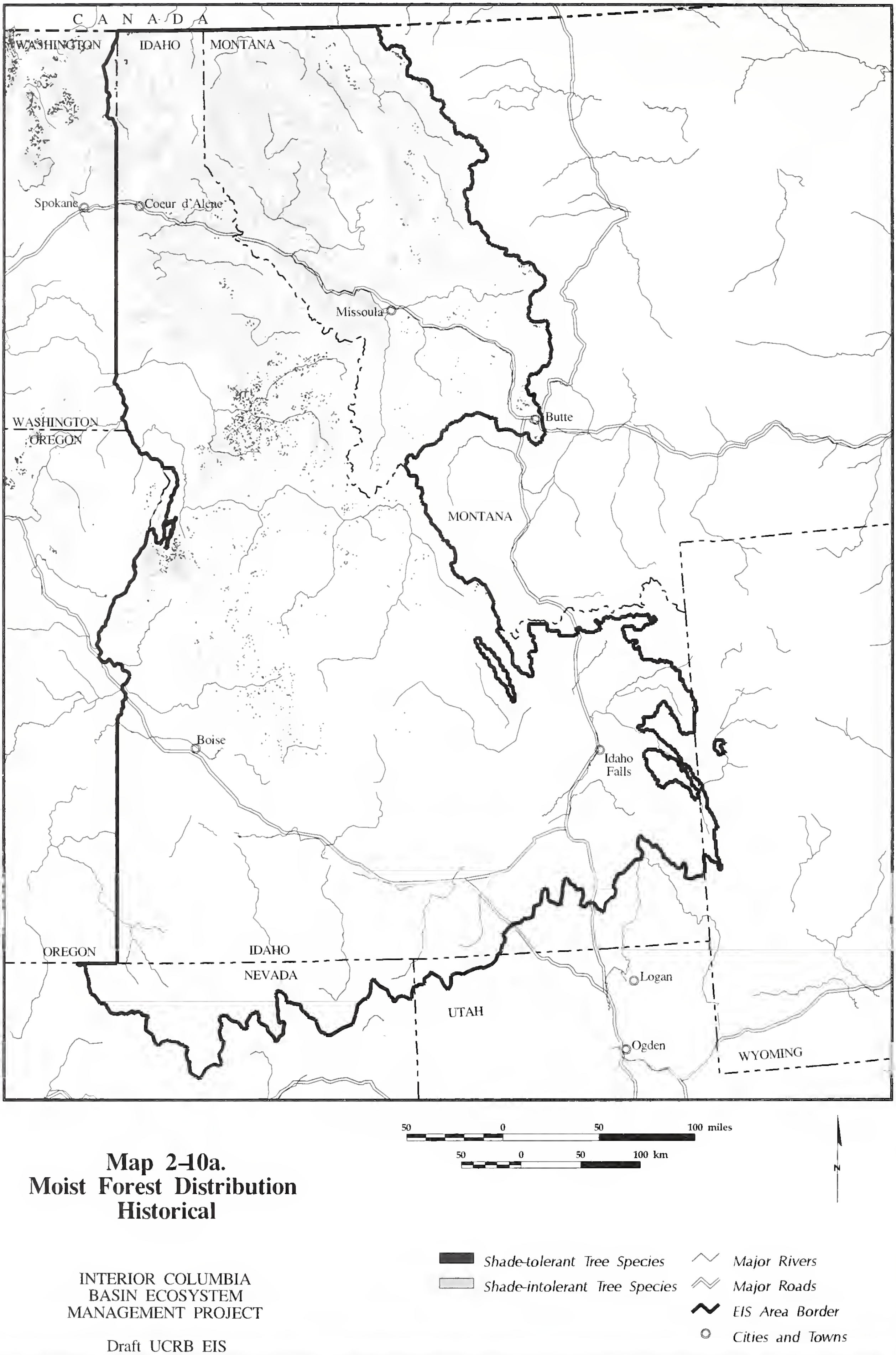
Composition and Structure

Shade-intolerant species, which historically dominated 70 to 80 percent of moist forest stands, are western white pine, western larch, lodgepole pine, interior ponderosa pine, and sometimes interior Douglas-fir. The dominant shade-tolerant species are Engelmann spruce, subalpine fir, grand fir, white fir, interior Douglas-fir, western redcedar, western hemlock, and mountain hemlock.

Typically in both young and old healthy moist forests, single layer forests are dominated by shade-intolerant species. Occasionally, there are long periods (50 to 150 years) between fires where shade-intolerant species shift to shade-tolerant species, because young trees growing in the shade of mature trees are not thinned out by fire. Old multi-layer stands often have a mix of shade-tolerant and intolerant species, depending on the fire history of the stand.

The adequate moisture levels, moderate climate, and presence of soils derived from volcanic ash often make moist forests ideal for tree growth and productivity. Forests within the moist forest potential vegetation group that do not have severe fires are composed of four dominant tree species: Douglas-fir, grand fir, western hemlock, and white fir. Grand fir is the most common species. These stands typically have more variety in tree species than the dry forest potential vegetation group. Stands that experience intense fires, or other disturbances that opened up the stand to sunlight, are dominated by lodgepole pine, western larch, Douglas-fir, and ponderosa pine (Johnson et al. 1994).

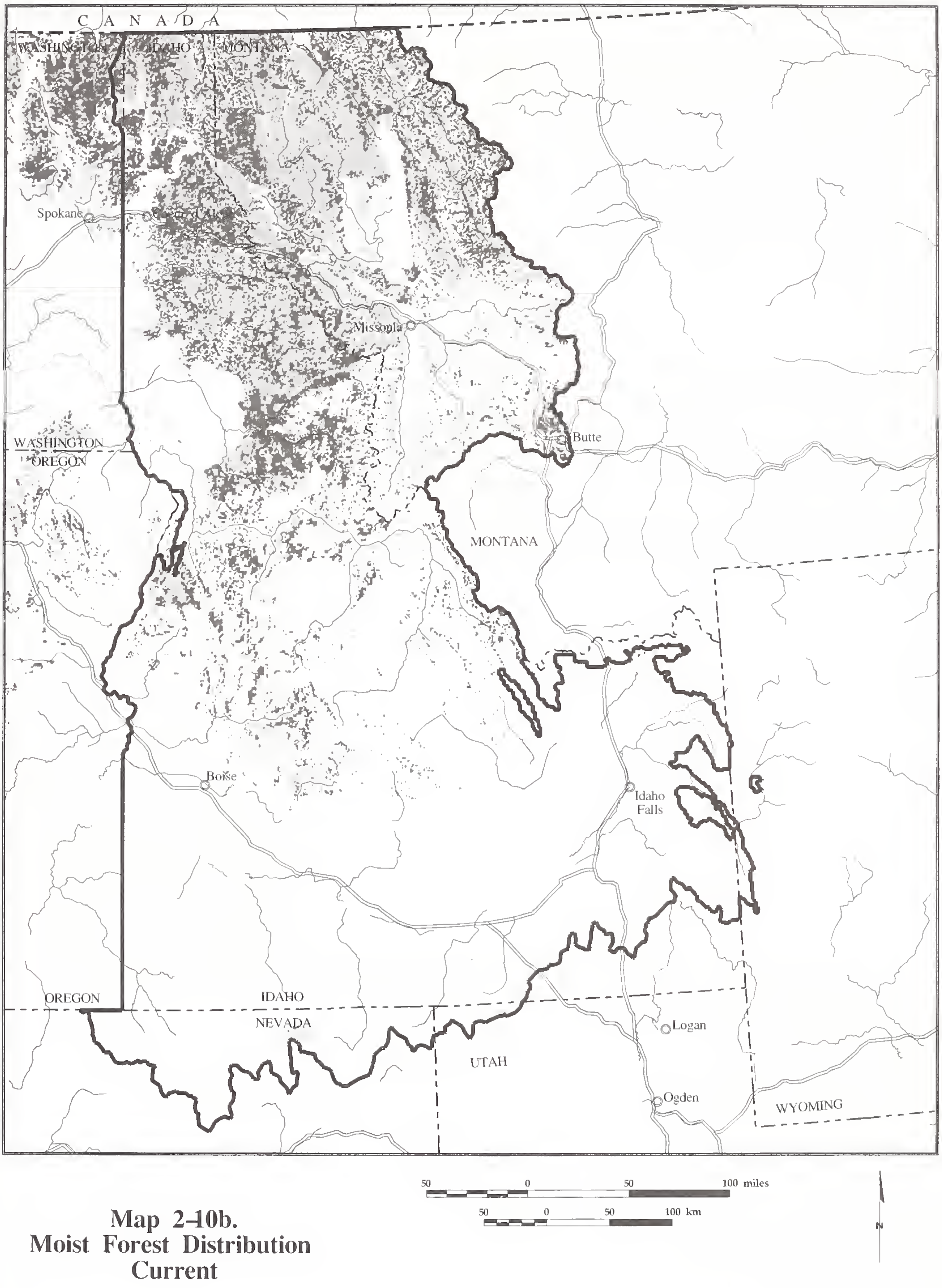
As in dry forest, quaking aspen can be found in the moist forest PVG. Other vegetation in moist forest is highly diverse. Shrub and herbaceous



Map 2-10a. Moist Forest Distribution Historical

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Draft UCRB EIS
1996



**Map 2-10b.
Moist Forest Distribution
Current**

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Draft UCRB EIS
1996

understories have evolved under limited light and lower fire frequencies than in dry forest. Shrub species include: Oregon boxwood, big huckleberry, oceanspray, baldhip rose, streambank gooseberry, prince's pine, and American twinflower. Herbaceous species are characterized by shade-tolerant herbaceous species, including: queencup beadlily, mountain lady's slipper orchid, heart-leaved arnica, wild ginger, sword fern, white trillium, and pioneer violet. Grasses include: pinegrass, Columbia brome, and tufted hairgrass. One sedge species, Ross' sedge, appears to be widely distributed across the project area in the moist forest PVG.

Historical Conditions

Historically, the UCRB planning area moist forests contained large stands of western white pine at elevations ranging from 2,000 to 6,000 feet. The best stands were found in wide river bottoms, gently rolling slopes, and gentle northerly slopes. Western white pine is a fire-adapted species (intermediate in terms of fire resistance). Its prevalence was due mainly to fires that destroyed other stands of tree species, allowing white pine to become established.

Historically, the most common fire regime in this PVG was mixed severity (about 58 percent), with a return interval that generally ranged from 26 to 150 years, with some up to 300 years (table 2-9). About 15 percent of the area would sustain nonlethal underburns, with half of these occurring at intervals of less than 25 years on benches and ridges. About 28 percent could sustain lethal stand-replacing fires, mostly on upland slopes at 76- to 300-year intervals. Creeping, low-intensity fires maintained the multi-layered old forest in cool, moist bottoms where fires created small openings that filled with young trees (Landscape Ecology STAR 1996).

Historical insect and disease disturbances were similar to those discussed in the dry forest potential vegetation group. White pine blister rust, an introduced disease that was not present historically, is discussed in the current conditions and trends section below.

Moist forests evolved with shade-intolerant species that dominated 70 to 80 percent of landscapes. Historically, moist forest structure was fairly dynamic, and early-seral forest structure comprised 20 to 30 percent of the area in moist forests. Young mid-seral forests generally comprised from 40 to 50 percent composition of the moist forest PVG, and were typically cycled back to early-seral structural stages by lethal fire events. Late-seral and old structures varied between 20 and 30 percent composition. In many cases, low intensity burns on the forest floor, or mixes of low and high intensity fires, maintained the young forest stage or moved it toward single layer late-seral, or old, forests. Creeping, low intensity fires maintained the multi-layered, old forest in cool, moist bottoms where fires

Table 2-9. Changes in Fire Regimes in the Moist Forest PVG, in Percent of UCRB Planning Area, FS-/BLM-Administered Lands.

Fire Regime Class	Historical Percent	Current Percent
Nonlethal underburns, very frequent (<25 years)	7.2	0
Nonlethal underburns, frequent (26–75 years)	3.7	0
Nonlethal underburns, infrequent (76–150 years)	3.7	3.2
Nonlethal Underburns	**14.6**	**3.2**
Mixed severity, very frequent (<25 years)	4.0	0
Mixed severity, frequent (26–75 years)	24.4	1.0
Mixed severity, infrequent (76–150 years)	21.7	21.7
Mixed severity, very infrequent (151–300 years)	7.8	0
Mixed Severity	**57.9**	**22.7**
Lethal, stand-replacing, frequent (26–75 years)	1.7	6.0
Lethal, stand-replacing, infrequent (76–150 years)	11.0	37.4
Lethal, stand-replacing, very infrequent (151–300 years)	14.8	30.6
Lethal, Stand-Replacing	**27.5**	**74.0**

Source: ICBEMP GIS Data (1KM² raster data)

created small openings that filled with young trees (Landscape Ecology STAR 1996).

Current Conditions and Trends: Departures in Composition, Structure, and Disturbance Patterns and Processes

Departures in Composition and Structure

Forest succession, an increase in lethal stand-replacing fires (table 2-9), and an increase in human disturbances have changed the structure and composition of vegetation within moist forests. Because fires in moist forest were less common than in dry forests, the effects of fire exclusion on forest structure and composition are not as obvious in moist forests. Major changes to the moist forest potential vegetation group include the network of roads and timber harvest units across the landscape; increased stand density in forests; increased dominance by shade-tolerant species; dominance of young stands of trees by even-aged grand fir, Douglas-fir, or white fir species; rapid decline in western white pine due to introduced blister rust; reductions in early-seral and old stands; and increases in young mid-seral stands. These changes have decreased productivity, increased the probability of severe or chaotic events, and decreased the similarity to the temporal, spatial, and habitat diversity of the native system.

The old single story stage of these shade-intolerant species has decreased 86 percent from historical amounts, while the shade-tolerant species have doubled from historical amounts. The old multi-story stage of these shade-

Photo 7 (Aerial View). Loss of old forest structures in the moist forest is evident in the fairly uniform size class of the crown as seen from the air. Photo by USFS.

Photo 8 (Surface View): Predominantly young forest structures characterize the current condition of the moist forest in the UCRB planning area. Photo by USFS.

intolerant species has decreased 67 percent from historical amounts, while the shade-tolerant species have decreased 14 percent from historical amounts. The young forest stage of shade-tolerant species is much higher in density and composition, having doubled from historical amounts, while the regeneration stage of shade-intolerant species has decreased 33 percent from historical amounts. Figure 2-9 earlier in this section shows the changes in shade-tolerant and intolerant species in moist forests by seral stage.

Landscapes are now dominated by shade-tolerant species, or a mixture of shade-tolerant and intolerant species, particularly in areas that have been harvested and fire suppression has been successful. These harvests have not generally left the snag structure that existed historically. Fire suppression has been most successful in roaded areas, which has substantially changed seral stage composition and community composition and structure.

Departures in Fire Regimes

The most important change in the fire regime has been the shift to 74 percent lethal stand-replacing fires (table 2-9). The effective exclusion of almost all nonlethal underburns (currently 3 percent) and a reduction of mixed severity fires (currently 23 percent) has resulted in the development of dense multi-layered stands with high potential for stand-replacing fires. These highly productive forests have increased amounts of carbon and nutrients stored in woody material, resulting in fires that are of higher fireline intensity and severity. Even where fires do not crown, dominant trees can be killed by consumption of large diameter surface fuels and duff layers. Potential for high amounts of soil heating and death of tree roots and other understory plants is much higher than it was historically.

Human Disturbance

In general, moist forests that have been identified with forest health problems are in areas that have been roaded and harvested. Clearcuts or partial cuts where western larch, western white pine, and ponderosa pine were harvested have changed stand structure and composition. The resulting stands have few of the large dead or live trees that historically could have remained on most sites, even after intense fire events. With the selective removal of shade-intolerant species, seed to grow new trees mainly came from shade-tolerant trees or trees with poor form or growth. Fire exclusion reduced the thinning effect that historically favored shade-intolerant trees in the stands. Seed from poorly formed or undesired trees may pass on characteristics that will not provide the wood quality or other tree values desired in the future.

Tree harvest and fire exclusion have compounded forest health concerns through their roles in the extensive loss of western white pine to blister rust, and unsuccessful regeneration (Landscape Ecology STAR 1996). Western white pine has been replaced by grand fir and white fir (now representing 28 percent of the area in moist forest), western larch (24 percent), and shrub/herb/tree regeneration (17 percent). The aspen forest type has also declined. Aspen is a short-lived species that can be replaced by conifers; it reproduces almost exclusively by sprouting after extensive disturbance, especially fire. Causes for decline in aspen include fire suppression in regenerating aspen stands, and infestations of large aspen tortrix and satin moth in some aging aspen stands. Habitat diversity for wildlife provided by these forest types has also decreased, as have scenic qualities, recreation values, and wood products provided by species in decline. As in dry forests, large trees, early-seral stands, and old single layered stands have decreased. Young, and multi-layered old stands have increased.

Soil fertility of some sites has been depleted through timber harvest practices, or from multiple burns, which displaces or erodes surface soil, or removes much of the large woody material, litter, or duff. Forest health concerns are raised by lower productivity, higher probability of insect and disease infestation, higher probability of high intensity fires, and changes in habitat conditions (Landscape Ecology STAR 1996).

Insects and Disease

Similar to changes in dry forest systems of the project area, susceptibility to large-scale damage by insect infestations and diseases has increased in many moist forests, contributing to forest health problems. The moist forest is a productive environment where insects and disease are very active, given the right hosts (Landscape Ecology STAR 1996). Tree density has increased and vigor has decreased in moist Douglas-fir and grand fir forests, making them more susceptible to insect and disease damage. Timber harvest and mortality from fir engraver beetles in productive grand and white fir patches, has contributed to the sharp decline of

this type. Areas susceptible to western larch dwarf mistletoe decreased because the western larch cover type in the Northern Glaciated Mountains (ERU 7) also decreased (Landscape Ecology STAR 1996).

Lodgepole pine forests are more susceptible to mountain pine beetle outbreaks in the Lower Clark Fork, Upper Clark Fork, and Northern Glaciated Mountains ERUs. Increased susceptibility is associated with the effects of prolonged fire exclusion, which yields increasingly large areas of lodgepole pine of uniform size and therefore landscapes that are more synchronized in their susceptibility to fire and beetle disturbance.

An additional forest health concern is that, with few exceptions, areas susceptible to Armillaria root disease, laminated root rot, and S-group annosum root disease increased across the UCRB planning area. Areas susceptible to Armillaria root disease increased in the Central Idaho Mountains, Lower Clark Fork, and Northern Glaciated Mountains ERUs. Areas susceptible to S-group annosum root disease increased in the Central Idaho Mountains and Northern Glaciated Mountains ERUs. Increases in susceptibility to root diseases are associated with effective fire exclusion, the selective harvest of shade-intolerant species, and the contagious spread of Douglas-fir and true firs in dense, multi-layer arrangements. Historically, fires not only favored the regeneration and release of shade-intolerant species by providing large openings and bare mineral soil, but they also minimized fuel loads and effectively thinned from below, favoring lower tree densities and drought and disease tolerance (Landscape Ecology STAR 1996).

White pine blister rust is the primary introduced disease that has changed successional pathways, cover types, and/or structures of western white pine. This has seriously affected native successional potentials in at least 50 percent of the moist forest PVG, where western white pine was a dominant or common residual large tree structure.

Terrestrial Species and Habitats in Moist Forests

General Trends

Moist forests support a high level of terrestrial diversity, and have more tree species and more variety in stand structure than dry forests. This variety provides more habitat types, and therefore more available niches for different species. The wetter climate promotes more flowering plants to provide food for a variety of species. Key Environmental Correlates, such as downed logs and litter, provide habitat for species such as carpenter ants, fungi, mosses, lichens, checkered beetles, Coeur d'Alene salamander (an endemic species), rubber boas, and other snakes. These and other species contribute to the breakdown of logs, returning nutrients to the soil. They also provide food for bears, snakes, lizards, pileated woodpeckers, and other species (Terrestrial STAR 1996).

Dense stocking of stands has reduced light to the forest floor, which has reduced understory vegetation, temperature, and decomposition rate and nature of woody debris. These changes affect nutrient cycling and energy flows, which in turn reduces soil productivity, plant growth, and

Photo 9. Small mammals such as chipmunks find protection from predators in the microhabitats within the jumble of small logs and canopy cover in the moist forest.

habitat for animals. The mosaic of habitat conditions and islands of unburned habitat created by fire in moist forests have been reduced. Current stands are more uniform, which may limit the reintroduction of insect and soil organisms into disturbed areas. Large shade-intolerant trees (ponderosa pine and western larch), live and dead, have decreased (Landscape Ecology and Terrestrial STARs 1996). There also has been an increase in young age classes of forests dominated by shade-tolerant tree species (fir species and Engelmann spruce).

Roads, especially interstate highways or other multi-laned high-traffic roads, present barriers to carnivores and other species. While the situation may be infrequent, it causes major problems where it occurs.

Invertebrates

Invertebrates live in the soil, litter, leaves, needles, bark, wood, understory plants, and special habitats (rock, talus, caves, etc.). These Key Environmental Correlates are more abundant in moist forests. The moisture in the forest keeps these habitats from drying out as easily as in dry forests. This creates a more favorable environment for many invertebrates, especially snails, slugs, litter and soil organisms, and wood decomposers. See the Dry Forest Potential Vegetation Group section for a more complete discussion of invertebrates.

Amphibians

Moist forests have a rich diversity of amphibians due to the damp climate and high presence of aquatic habitats. Moist forests in northern Idaho and Montana provide habitat for several species of salamanders, one species of newt, one toad, and several frog species (Terrestrial Staff database). These species use downed logs and burrows in the soil and litter but must be near water to reproduce. Spotted frogs occur in the moist forest of northern Idaho and Montana. The Coeur d'Alene salamander is a local endemic that occurs mostly in northern Idaho and limited areas in Montana. Since amphibians have permeable skins, they are good indicators of changes in water quality, climate, and microsites. Amphibians also help control insects; serve as food to fish, small birds, and mammals; provide burrows for other animals; and turn over soil.

Mining of talus and rock for road construction, large reservoir construction, and other activities are affecting amphibians such as the spotted frog (Terrestrial STAR 1996). Activities such as timber harvest, road or trail construction, and loss of wetlands may be affecting wet areas that are seasonally important to amphibians, which require wetlands or standing water as their primary habitat. Introductions of exotic species such as fish and the bullfrog can also be causing a detrimental effect because they prey on native amphibians.

Reptiles

Habitat selection for snakes and lizards is driven more by the need for warm climates, rocks, talus, and soils suitable for burrows, than by specific vegetation needs (Terrestrial STAR 1996). Reptile habitat exists in moist forests, especially in openings, south-facing slopes, and rock outcrops. One turtle, four lizards, and several snake species use moist forests (Terrestrial Staff database).

Birds

Moist forests typically have multiple layers of trees which provide an increased variety of bird habitat over dry forest stands. Many birds nest at specific heights off the ground or in trees of a certain diameter range. The Terrestrial Staff database lists 127 species of birds that use moist forests in the project area, which increases to 150 if riparian habitats are present. Birds nest and feed in the canopies of trees, in cavities they excavate, in cavities excavated by other species, on the trunks or branches of trees, on the ground, or near water (Thomas et al. 1979). Species that use large trees include the goshawk, pilleated woodpecker, Lewis' woodpecker, northern three-toed woodpecker, and boreal owl. Extensive areas with large shade-intolerant tree species alive and dead (western larch, western white pine and ponderosa pine) have been reduced because of past forest harvesting and exotic blister rust that affected western white pine (Landscape Ecology and Terrestrial STARs 1996).

Aspen stands tend to be small and scattered in moist forests, but are important for nesting and feeding habitat for many birds, including red-breasted and red-naped sapsuckers, western tanager, violet-green swallow, and Swainson's thrush (Thomas et al. 1979). In general, aspen stands fill a vital role in providing Key Environmental Correlates, and they are in decline in the project area largely due to fire exclusion.

Based on breeding bird surveys, populations of twice as many neotropical bird species in forests have increased (10 species) than have decreased

(5 species). Species that use this type of forest structure (northern goshawk, Vaux's swift, pileated woodpecker, Hammond's flycatcher, pygmy nuthatch, and Swainson's thrush) are thought to have decreased, but no data is available that shows a long-term decline of these species. Brown-headed cowbirds, which are nest parasites on other birds, have increased (Collopy and Smith 1995).

Mammals

In total, 89 species of large and small mammals use different structural stages of moist forests (Terrestrial Staff database). However, the number of species in the Blue Mountains (ERU 6) is limited by the isolation of the moist forest from other adjacent forested habitats, especially for the less mobile species (Collopy and Smith 1995).

Moist forests are used by many species of ungulates that are socially and economically important for hunting and viewing and that are used for food and other cultural and spiritual values by local American Indian tribes. Big game species are food for bears, mountain lions, wolves, other large carnivores, and humans. Elk, moose, and mule deer use moist forests, especially meadows, shrublands, and early seral forests for summer range. Bighorn sheep use cliffs and rock walls within the moist forests and feed in and move through grass and low shrub habitat, but avoid stands of trees or tall shrubs because of increased opportunity of predation (Lyon et al. 1995). Aspen sprouts and buds within moist forests provide important winter and early spring nutrition for elk, deer, bear, grouse, and hares.

Mountain bighorn sheep populations have declined in many areas due to the spread of disease from domestic sheep, conifer encroachment, and increased habitat isolation (Terrestrial STAR 1996, Lyon et al. 1995). Moose are gradually increasing in most forest habitats, especially in areas near Canadian moose populations and where transplant programs have been implemented.

The endangered Selkirk woodland caribou exists only in northeastern Washington, northern Idaho, and southwestern Canada, mostly in the Northern Glaciated Mountains (ERU 7). Caribou live in old forests of Engelmann spruce/subalpine fir and western redcedar/western hemlock, which may be affected by fires, insects and disease, logging, and other disturbances. Although these small populations have been stable, there is concern about low reproductive success, predation, poaching, and harassment of the animals during the winter (USF&WS Status Report 1995, Terrestrial STAR 1996).

The red-backed vole, northern flying squirrel, pygmy shrew, redtail chipmunk, and other moist-forest mammals may be declining due to the decrease in the amount of old moist forests and reduction of large dead trees, both standing and on the forest floor in areas that have been roaded and harvested. These small mammal species are important food for owls, hawks, American martens, fishers, and other carnivores, as well as for distributing and planting seeds throughout the forest (Collopy and Smith 1995).

Cold Forest Potential Vegetation Group

Potential Vegetation Types (PVTs): Cold Forest

Mountain hemlock-Inland
Spruce-fir, dry with aspen
Spruce-fir, dry without aspen
Spruce-fir, (whitebark pine greater than lodgepole pine)
Spruce-fir, (lodgepole pine greater than whitebark pine)
Whitebark pine/alpine larch-North
Whitebark pine/alpine larch-South

Distribution and Description

The cold forest potential vegetation group is a major component of vegetation at higher elevations, but it occurs on only about 10 percent of the ICBEMP project area and 18 percent of the UCRB planning area. The Forest Service or BLM administers 87 percent of the cold forest group. In the UCRB planning area, the cold forest PVG is primarily distributed in ERUs 9 and 13 in central Idaho and southwest Montana (see map 2-5 in the Introduction to the Terrestrial Ecosystems section).

Subalpine sites that support cold forests are more difficult for tree establishment and growth, and they define the upper limits of tree survival on mountains. Cold forests are generally limited by a short growing season; on some sites these forests are also limited by low available moisture. Rates of tree growth are generally slow in comparison to moist forests. Nutrients are often

limited, and loss of volcanic ash soil, litter, surface soil, or tree foliage from the site can greatly reduce productivity. Maintenance of dead and downed wood on these sites is important for nutrient cycling (Landscape Ecology STAR 1996).

Tree regeneration in the cold forest group is generally slow; mortality from stress, insects, and disease generally thins the stands and accelerates growth of the surviving trees. Cold forests extend into moist forests along stream courses, cold air pockets, or other cold sites (Landscape Ecology STAR 1996).

Maps 2-10c and 2-10d show the historical and current distributions of tree species within the cold forest PVG.

Composition and Structure

Dominant shade-intolerant species in cold forests are lodgepole pine, whitebark pine, and alpine larch. Dominant shade-tolerant species in cold forests are Engelmann spruce, subalpine fir, aspen, and interior Douglas-fir.

With an absence of disturbance, cold forests are dominated by subalpine fir or Engelmann spruce. Spruce tends to be present on moist sites and in areas with cold air pockets. Subalpine fir dominates when sites are too cold for other shade-tolerant species. Fire can maintain aspen stands by killing conifers that have established and by causing aspen to vegetatively regenerate. When fire is present as a disturbance, lodgepole pine is the principal species after intense fires kill most trees. Douglas-fir and western larch are important species on warmer, drier, disturbed sites, especially on southerly slopes at higher elevations or lower slope elevations adjacent to grand fir forests (Johnson et al. 1994).

Whitebark pine may be a codominate with subalpine fir in stands at the upper limits of tree growth (timberline). Whitebark pine forests exist in harsh areas with high winds, and can withstand severe ice and snow damage which create open or clumped stands (Johnson et al. 1994).

Other vegetation of the cold forest PVG includes shrubs and grasses which have evolved under natural cycles of fire and ice. Many of these species are perennial, surviving years in which flowering and fruiting cycles are disrupted by the early arrival of killing frosts. The transition zone between the lower elevations of cold forest, and the upper elevations of moist forest is characterized by relatively moist openings that support meadow vegetation.

Characteristic shrubs of the cold forest PVG include fool's huckleberry, grouse huckleberry, cascades azalea, laborador tea and thimbleberry. Herbaceous species include: white-coiled beak, white hawkweed, alpine hawkweed, pink elephant heads and explorer's gentian. Grasses include: green fescue, western needlegrass, Idaho fescue, and bluebunch wheatgrass.

Historical Conditions

Historically, fire intervals in the cold forest potential vegetation group were highly variable and correlated with landforms. Over three-quarters of the area of this PVG would support mixed severity fires (table 2-10), creating a mixture of lethal and nonlethal effects on the overstory at intervals of 76 to 150 years. These fires were often intermingled with other fire regimes during one or a series of fire events, and effectively reduced fuels, thinned the stand, and killed less fire-tolerant species. Less than 10 percent of the landscape burned with fires that were lethal to all of the dominant overstory. Lethal stand-replacing fires occurred at a fairly high frequency in younger forests on steeper slopes, and rarely in wet bottoms and basins with late-seral multi-story forests. Nonlethal underburns would occur on about 13 percent of the landscape, where they maintained late seral single story forests of whitebark pine and lodgepole pine, typically on ridges and flat benches.

The mixed fire regime was often intermixed with the other regimes in one fire event or through a series of fire events. The fire season for this group was, and is, short~ generally the month of August (Landscape Ecology STAR 1996). Fires that burned hot enough to kill trees changed stand composition from shade-tolerant species to shade-intolerant species, such as lodgepole pine (Lehmkuhl et al. 1994). Depending on the extent of the fire and weather that followed, substantial burned areas have remained treeless for decades unless a seed source of lodgepole pine was present at the time of the burn. Where lodgepole pine is present, tree cover is usually rapidly reestablished (Agee 1993). These severe fires also changed the old multi-layer stands that developed with low intensity fire events to single layer stands. Large fires maintained large patches of similar forest conditions within river drainages, compared with dry and moist forests that tended to have small patches created by fire events (Agee 1993).

In general, a fairly high component of the old multi-layer forest was maintained. These old forests were typically found in cold, wet bottoms or basins where fires either did not burn, or

Table 2-10. Changes in Fire Regimes in the Cold Forest PVG, in Percent of UCRB Planning Area, FS-/BLM-Administered Lands.

Fire Regime Class	Historical Percent	Current Percent
Nonlethal underburns, very frequent (<25 years)	8.9	0
Nonlethal underburns, frequent (26–75 years)	1.4	0
Nonlethal underburns, infrequent (76–150 years)	0	0
Nonlethal Underburns	**10.3**	**0**
Mixed severity, frequent (26–75 years)	4.1	0
Mixed severity, infrequent (76–150 years)	65.9	41.1
Mixed severity, very infrequent (151–300 years)	5.4	0
Mixed Severity	**75.4**	**41.1**
Lethal, stand-replacing, frequent (26–75 years)	4.5	0
Lethal, stand-replacing, infrequent (76–150 years)	1.8	14.0
Lethal, stand-replacing, very infrequent (151–300 years)	8.0	44.9
Lethal, Stand-Replacing	**14.3**	**58.9**

Source: ICBEMP GIS Data (1KM^2 raster data)

burned in a patchy pattern. Old single layer forests were generally maintained by frequent ground fires on benches and ridges dominated by whitebark and lodgepole pine (Landscape Ecology STAR 1996).

Cold forests historically also experienced endemic insect and disease occurrences, which occasionally grew into a localized epidemic. Mountain pine beetle historically attacked and killed large areas of lodgepole pine.

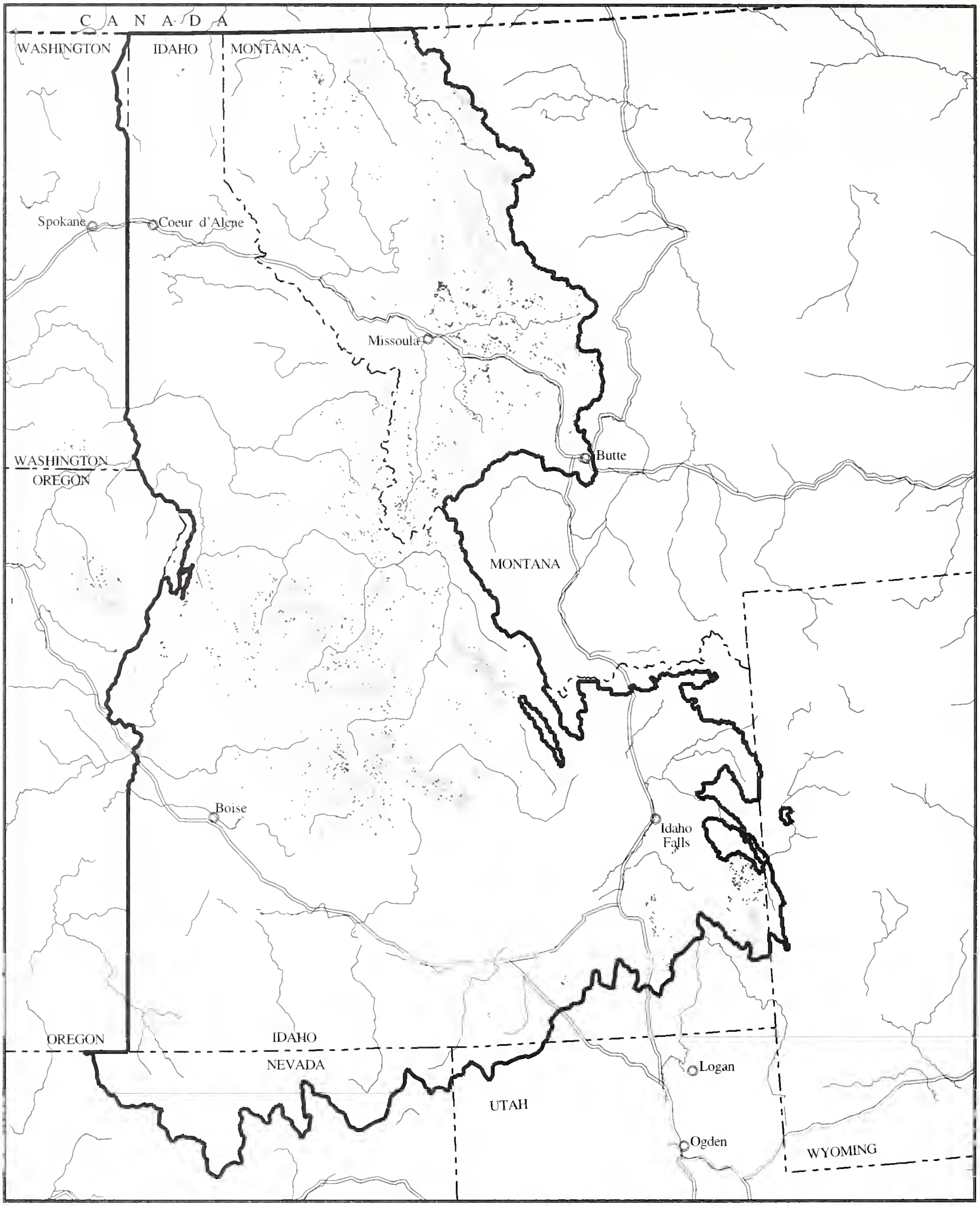
Current Conditions and Trends: Departures in Composition, Structure, and Disturbance Patterns and Processes

Departures in Composition and Structure

Effects of fire exclusion, logging, road building, livestock grazing, and other modifications on forest structure and composition are not as noticeable in the cold forest as in the other forest PVGs, because cold forests have longer fire intervals and fewer human-caused disturbances than dry or moist forests. The cold climate and short growing season in cold forests also slow the natural rate of change in vegetation when compared to dry or moist forests. However, some changes from historical conditions have occurred. The PVG has generally shifted to a predominance of regeneration and young forest structural stages and has become dominant in shade-tolerant species or a mixture of shade-tolerant and intolerant species. Primary changes in vegetation composition and structure have been in response to road and timber harvest; exotic blister rust disease on whitebark pine, which has resulted in an approximately 95 percent loss of whitebark pine/alpine larch; and changes in fire type and frequency. Where whitebark pine and alpine larch have declined, they have been replaced by Engelmann spruce and subalpine fir. In particular, loss of whitebark pine and alpine larch habitat~ due to white pine blister rust and overstocking resulting from fire exclusion~ has become a forest health concern in the past ten years (Landscape Ecology STAR 1996).

Departures in Fire Regime

Changes in landscape structure and composition have typically resulted in higher surface fuel loads and greater crowning potential over larger areas. The predominant fire regime is now lethal stand-replacing fires (about 59 percent), most of which burn at very infrequent intervals of 150 to 300 years (table 2-10). About 41 percent of fires are mixed severity, and nonlethal underburns have essentially been eliminated from the present fire regime.

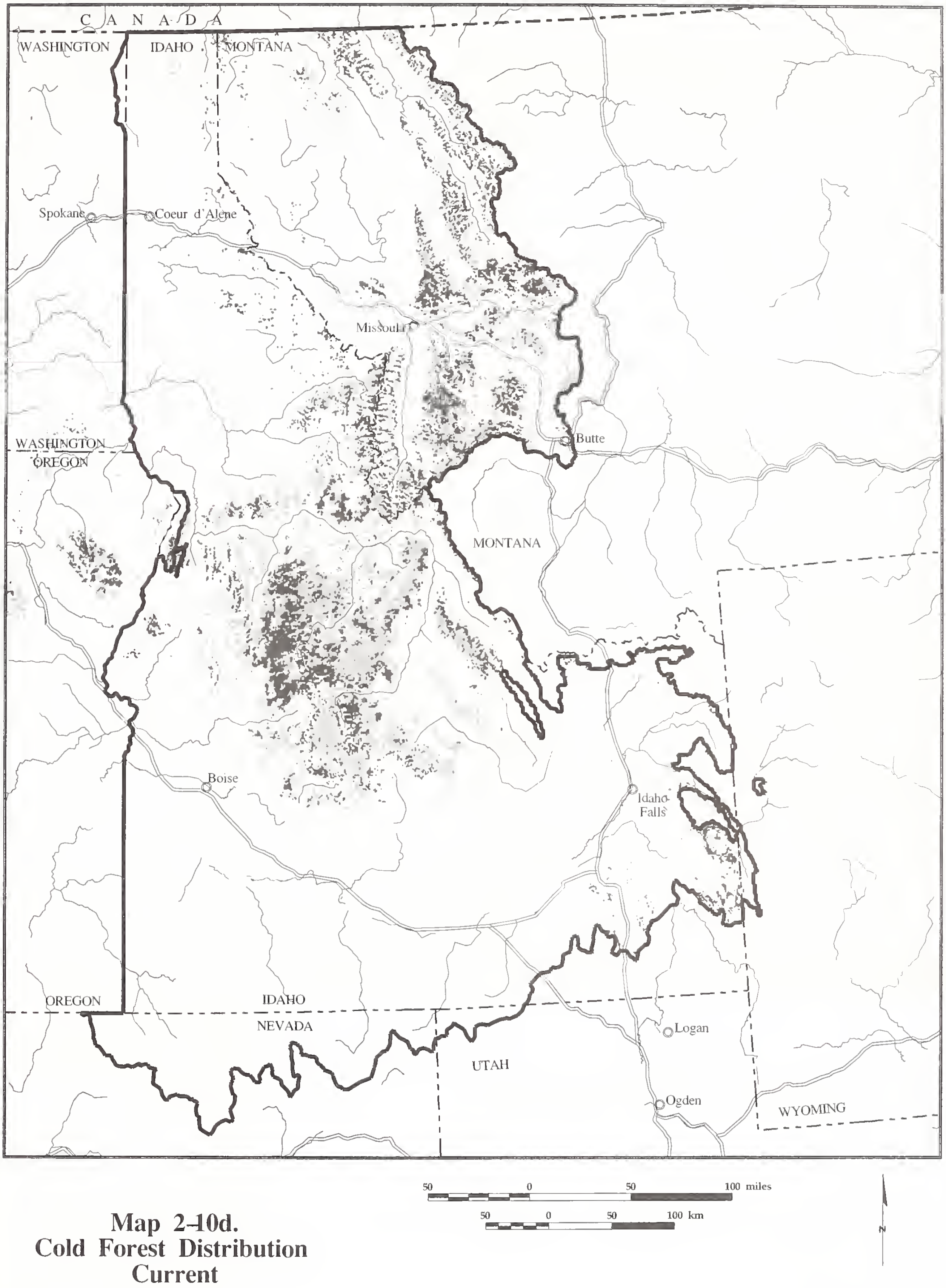


Map 2-10c. Cold Forest Distribution Historical

Shade-tolerant Tree Species
Shade-intolerant Tree Species
Major Rivers
Major Roads
EIS Area Border
Cities and Towns

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Draft UCRB EIS
1996



Map 2-10d. Cold Forest Distribution Current

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Draft UCRB EIS
1996

Human Disturbance

Some of the old multi-layer forest has been harvested. Although the old single-layer forest has not changed much, its composition is deteriorating with the loss of whitebark pine due to blister rust. Young forests have increased, generally as a result of harvesting old multi-layer forests. These harvested areas generally do not have the number of snags that occurred historically, which limits habitat for birds, mammals, and insects that need dead trees (Terrestrial and Landscape Ecology STARs 1996). Additionally, cold forests have experienced more frequent lethal fires in the past ten years than they did under historical conditions, partly due to the spread of fires from other forest types during drought periods.

Historically, shade-intolerant species dominated regeneration and young forest environments. This relationship has been altered, resulting in landscapes that now have mixed dominance or are dominated by shade-tolerant species such as extensive areas where conifers have replaced or are replacing aspen. This is especially true where timber harvest and fire exclusion have favored the establishment of shade-tolerant species. As a result, much of the area where investments have been made (roads, harvest, planting, thinning, etc.) is highly susceptible to tree mortality from fire, insects, disease, and stress (Landscape Ecology STAR 1996).

Insects and Disease

With fire exclusion, more areas of pine are in a mature, more susceptible stage. Consequently, outbreaks of mountain pine beetle infest larger areas, for longer periods, and often with greater intensity than occurred historically. Increasing size of susceptible stands of trees have also contributed to higher levels of other insects and diseases.

White pine blister rust is the primary introduced disease that has changed successional pathways, cover types, and/or structures of whitebark pine. This has seriously affected native successional potentials in at least 50 percent of the cold forest PVG, where whitebark pine was a dominant or common residual large tree structure.

Terrestrial Species and Habitats in Cold Forests

General Trends

Cold forests areas, mostly in the Northern Glaciated Mountains and the Lower Clark Fork (ERUs 7, 8), support several rare wildlife species, or species with very limited distributions. These areas have unique habitats, such as springs, seeps, microsites for insects, and islands of alpine habitat that are isolated from other alpine habitat in Canada. These subalpine and Arctic habitats were connected at various times in history when climates cooled and glaciers advanced. Whitebark pine is an important source of seeds for grizzly bears, birds, and small mammals. Clark's nutcracker, a common bird in cold forests, is responsible for transporting whitebark pine seed for future seedlings, and squirrels and chipmunks cache seed when it is available.

Photo 10. Bears are among the wildlife species in cold forests that are particularly sensitive to human activity.
Ravi Miro Fry Photo.

Cold forests have lower productivity, steeper terrain, and a shorter growing season than do dry or moist forests. Therefore, they have had less timber harvest, road construction, and grazing, and thus fewer associated impacts on terrestrial wildlife species, habitats, and functions. The cold forest has not been modified as much as the dry and moist forest types. Although lower road densities limit some human activities, snowmobiling, helicopter skiing, downhill skiing, and dirt biking in cold forests can displace and stress wildlife from the noise and associated activities. Bighorn sheep, mountain goats, lynx, wolverine, and bears are particularly sensitive to human activity and need areas of refuge from roads and activities. Although mountain goats have extended their range into areas where they have not been historically, some populations have declined for unknown reasons (Terrestrial STAR 1996).

Invertebrates

See the Moist Forest Potential Vegetation Group section.

Amphibians and Reptiles

Cold forests and subalpine areas are generally too cold, with too short a breeding season, to provide much habitat for reptiles and amphibians. Four species of salamander, one newt, one toad, and seven frogs use the cold forest type in the UCRB planning area (Terrestrial Staff database), but in small numbers. The western toad and Pacific treefrog, which use some cold forest areas, are sensitive to changes in wetlands, springs, and ponds. No reptile species were listed in the Terrestrial Staff database as cold-forest inhabitants.

Birds

The Terrestrial Staff database lists 103 species of birds that use cold forest habitats. Although most species use both cold and moist forests, fewer birds use cold forests than use moist forests. This is due to climatic conditions caused by elevation that produce conditions such as lower diversity in tree species, fewer insects for food, and the shorter growing season. Some of the common birds found in higher elevation forests are the following: fox sparrow, dark-eyed junco, blue grouse, lazulibunting, and rufous and calliope hummingbirds. These species are found in different stages of forest development, from young to old.

Boreal owls and great gray owls occur in the cold forests in Idaho and Montana. As well as the rest of the project area. Long-eared owls nest in subalpine fir forests. Red-tailed hawks and great horned owls feed on voles and squirrels that inhabit these forests. The higher frequency of snags, especially larger diameter snags, in cold forests are important for hairy woodpeckers, Williamson's sapsucker, black-backed woodpeckers, and three-toed woodpeckers. These species create cavities used by northern flying squirrels, mountain chickadees, and they help control insect outbreaks and distribute seeds (Terrestrial STAR 1996).

Cold forests tend to have more downed logs and other woody material because of less extensive logging, less road access, slower decomposition rate, and longer fire intervals. Moisture, insects, fungi, and wildlife in search of insects affect the decomposition of logs. Franklin's, blue, and ruffed grouse, which are upland game birds, use logs in cold forests for cover and nesting areas. Logs are also used by vagrant shrews, amphibians, and many insects, fungi, and bacteria that are important to soil productivity and nutrient cycling (Terrestrial STAR 1996).

Mammals

As with birds, most mammal species that use moist forests also use cold forests. The Terrestrial Staff database lists 73 mammals in cold forests. American pika, lynx, wolverine, bog lemming, snowshoe hare, and the northern flying squirrel are closely tied to cold upper elevation forest habitats.

More than 35 percent of the cold forest is included in Wilderness, Wilderness Study Areas, or other Natural Areas (Terrestrial STAR 1996). In addition to this percentage, significant portions of cold forests are within unroaded habitat that has not been classified as Wilderness, Wilderness Study Areas, or other Natural Areas. Natural fires are more likely to be allowed in Wilderness or unroaded areas, which helps retain diversity in structural stages and create habitat mosaics in cold forests for the future. Many unroaded areas and areas with lower road densities and steeper terrain make these important refuge areas for species such as elk, bighorn sheep, mountain goat, grizzly bear, wolverine, and other species that can use this habitat to escape human

activity. Grizzly bears feed in avalanche chutes, wet meadows, talus, and downed logs in summer months. (Terrestrial STAR 1996)

Large mobile carnivore species with extensive home ranges often run into conflicts with humans and livestock when their habitat is reduced or affected by roads and other activities. Roads, especially interstate highways or other multi-laned high-traffic roads, present barriers to carnivores and other species. While the situation may be infrequent, it causes major problems where it occurs. In some cases roads have been a direct cause of mortality (Terrestrial STAR 1996, Martin et al. 1995). Although some large carnivores typically use mature forest habitat, others are habitat generalists and can use a variety of habitats (Terrestrial STAR 1996). In either case, the key to their survival appears to be large, interconnecting blocks of habitat with few human disturbances, which have become more scarce. Such habitat blocks reduce vulnerability to mortality and provide quality riparian areas and good sources of food such as deer, elk, carrion, hare, forbs, roots, and fish. Declines in whitebark pine have resulted in declines in an important food source for grizzly bears. (Terrestrial STAR 1996)

Because many of these animals are at the southern portion of their range (from Canada) and have low population normally, they are increasingly vulnerable to being killed. Attitudes of humans towards carnivores such as grizzly bears and wolves are likely more important for their well being than habitat conditions. In the past, Government-sponsored programs such as Animal Damage Control greatly contributed to the reduction of wolves and other predators. Sport hunting and trapping also may have reduced local populations of large carnivores.

Most of the smaller carnivores do not face such high negative public attitudes; thus, for these species, habitat conditions are more important. Species such as the American marten and Pacific fisher need late successional forest with abundant snags and downed logs. Wolverine may be affected by increasing human disturbance and use of subalpine communities in the cold forest and accidental mortality form trapping. Lynx require early seral stage boreal forest habitat supporting high populations of small mammals such as snowshoe hare, and older forest stages for denning (Terrestrial STAR 1996).

Summary of Changes from Historical to Current by Ecological Reporting Unit, by Potential Vegetation Type, and by Terrestrial Community for BLM/Forest Service-Administered Lands.

ERU 5 ~ Columbia Plateau

Cold Forest PVG.

◆A 35 percent decrease in early seral subalpine forest.

◆A 65 percent decrease in mid-seral subalpine forest.

Dry Forest PVG.

◆A 65 percent increase in mid-seral montane forest.

Moist Forest PVG.

◆A 45 percent increase in mid-seral montane forest.

ERU 6 ~ Blue Mountains

Dry Forest PVG.

◆A 35 percent increase in early seral montane forest.

Moist Forest PVG.

◆A 40 percent increase in early seral montane forest.

ERU 7 ~ Northern Glaciated Mountains

Dry Forest PVG.

◆A 40 percent increase in mid-seral montane forest.

Moist Forest PVG.

◆A 40 percent increase in early seral montane forest.

ERU 8 ~ Lower Clark Fork

Cold Forest PVG.

◆A 50 percent increase in mid-seral subalpine forest.

Dry Forest PVG.

◆A 60 percent increase in mid-seral montane forest.

ERU 9 ~ Upper Clark Fork

Dry Forest PVG.

◆A 30 percentincrease in mid-seral ponderosa pine forest.

ERU 10 ~ Owyhee Uplands

Cold Forest PVG.

- ◆A 55 percent decrease in early seral montane forest.

Dry Forest PVG.

- ◆A 30 percent increase in mid-seral montane forest.

Moist Forest PVG.

- ◆A 25 percent decrease in late seral ponderosa pine single layer forest.
- ◆A 35 percent decrease in mid-seral ponderosa pine forest.
- ◆A 70 percent increase in early seral montane forest.

ERU 11 ~ Upper Snake

Cold Forest PVG.

- ◆A 45 percent decrease in mid-seral subalpine forest.

ERU 12 ~ Snake Headwaters

Dry Forest PVG.

- ◆A 30 percent decrease in early seral montane forest.
- ◆A 55 percent increase in mid-seral montane forest.

Source: ICBEMP report ah43e_uc.rtf

Rangelands

Key Terms Used in this Section

Grazing pressure ~ The ratio of forage demand to forage available, for any specified forage, at any point in time. Thus, as forage demand increases relative to forage available, grazing pressure increases, and vice-versa.

Herbivore ~ An animal that subsists principally or entirely on plants or plant materials.

Invasion (plant) ~ The movement of a plant species into a new area outside its former range.

Key Ecological Functions ~ A wide range of roles that species play in the ecosystem, such as predation, herbivory, nutrient cycling, and biomass contributions.

Key Environmental Correlates ~ Environmental factors that are either associated with or required by a given species, such as downed wood, piles of bark, fire processes, and insect outbreaks.

Noxious Weed ~ A plant species designated by Federal or State law as generally possessing one or more of the following characteristics: aggressive and difficult to manage; parasitic; a carrier or host of serious insects or disease; or non-native, new, or not common to the United States. According to the Federal Noxious Weed Act (PL 93-639), a noxious weed is one that causes disease or has other adverse effects on man or his environment and therefore is detrimental to the agriculture and commerce of the United States and to the public health.

Summary of Conditions and Trends

The following ecological trends have occurred in the rangeland areas of the project area because of changes to native disturbance and successional processes since historical times:

- Rangeland noxious weeds are spreading rapidly and in some cases exponentially in every Range Cluster.
- Woody species encroachment and/or increasing density by woody species (sagebrush, juniper, ponderosa pine, lodgepole pine, Douglas-fir), especially on the dry grassland and cool shrubland vegetation types, have reduced herbaceous understory and biodiversity.
- Cheatgrass has taken over many dry shrubland vegetation types, increasing soil erosion and fire frequency and reducing biodiversity and wildlife habitat. Cheatgrass and other exotic plant infestations have simplified species composition, reduced biodiversity, changed species interactions and forage availability, and reduced the system's ability to buffer against change or act as wildlife strongholds in the face of long-term environmental variation.
- Degradation of riparian areas and subsequent loss of riparian vegetation cover has reduced riparian ecosystem function, water quality, and habitat for many aquatic and terrestrial species. (See Aquatics section for riparian area discussion.)
- Expansion of agricultural and urban areas on non-Federal lands has reduced the amount of some rangeland vegetation types, most notably dry grassland, dry shrubland, and riparian. Changes in some of the remaining habitat patches because of fragmentation, exotic species, disruption of natural fire cycles; overuse by livestock and wildlife; and loss of native species diversity have contributed to a number of wildlife species declines, some to the point of needing special attention (such as sage grouse, Columbian sharp-tailed grouse, California bighorn sheep, pygmy rabbit, kit fox, Washington and Idaho ground squirrels).
- Increased fragmentation and loss of connectivity within and between blocks of habitat, especially in the shrub steppe and riparian areas, have isolated some habitats and populations and reduced the

ability of populations to move across the landscape, resulting in long-term loss of genetic interchange.

- Slow-to-recover rangelands (usually rangelands that are in the <12" precipitation zone, such as dry shrublands with little herbaceous understory) are not recovering naturally at a pace that is acceptable to meet management objectives and are either highly susceptible to degradation or already dominated by cheatgrass and noxious weeds.
- Increasing human populations in the project area have resulted in an increase in access and human activity for all types of uses. In some places road density has increased over the density threshold (approximately one mile of road per square mile) above which many species will displace to avoid human activity. These uses can increase wildlife displacement and vulnerability to mortality, can fragment habitat, and can allow for access of exotic plants into new locations.

Introduction to Rangelands

Unless otherwise noted, information in this section is derived primarily from the Scientific Assessment Landscape Ecology Staff Area Report (1996) and Terrestrial Staff Area Report (1996).

BLM- or Forest Service-administered rangelands make up about 37 percent of the project area and about 35 percent of the planning area. Rangelands encompass grasslands, shrublands, woodlands, and the various riparian areas around permanent and non-permanent water. Only a few tree species are native to rangelands, and these typically are located in wetter areas, especially in riparian areas and areas close to forests. Before Europeans colonized the region, climate and fire played major roles in directing the way rangeland vegetation appeared on the landscape. Since the mid-1800s, humans have altered fire and its effects on vegetation, and have added new forces responsible for changes observed on rangelands. The non-forested landscape of the project area was historically a frequently changing mosaic of habitats that supported 350 vertebrate wildlife species and countless invertebrate species.

Rangeland vegetation has been combined into potential vegetation groups (PVGs) for discussion at this level of analysis. There are 29 potential vegetation types (PVTs) representing the rangeland or non-forested plant community, which have been divided into the following potential vegetation groups: dry grass, dry shrub, cool shrub, woodland, alpine, riparian shrub, and riparian woodland. Table 2-3, in the Introduction to Terrestrial Ecosystems section, lists the Rangeland PVGs that are discussed here. Woodland and alpine PVGs were not specifically discussed in this chapter because they represent very small portions of the project area and they have not changed significantly from historical times. Riparian shrub and Riparian woodland PVGs are discussed in the Riparian section later in this chapter.

Rangeland Health ~ A Definition

Rangeland health is defined "as the degree to which the integrity of the soil and the ecological processes of rangeland ecosystems are sustained." Rangeland health is synonymous with ecological health as discussed in Chapter 1 and the introduction to Chapter 2, but is applied strictly to rangeland ecosystems. Health has been used to indicate the proper function of complex systems; the term is increasingly applied to ecosystems to indicate a condition in which ecological processes are functioning properly to maintain the structure, organization, and activity of the system over time.

Soil integrity is critical for rangeland health and depends on an intact soil profile (layers of soil) and the condition of the soil surface. Important ecological processes in rangelands include the nutrient cycle, nitrogen cycle, and carbon cycle (see Figure 2-13, Nitrogen Cycle, later in this section; Figure 2-12, Carbon Cycle, in the Forestlands section); energy flows and the terrestrial food web (Figure 2-11, Terrestrial Food Web, in the Forestlands section); and plant community dynamics such as succession (Figure 2-14, Succession in the Sagebrush Steppe, later in this section).

Dry Grass Potential Vegetation Group

Potential Vegetation Type (PVT): Dry Grass

Agropyron steppe
Fescue grassland
Fescue grassland with conifer

Distribution and Description

The dry grass PVG is not currently a major group, making up only four percent of the project and UCRB planning areas, compared to nine percent for the project area historically. The BLM and Forest Service manage 44 percent of what is remaining in this group within the project area. The dry grass PVG can be found in all ERUs, but most is in the Columbia Plateau, Central Idaho Mountains, and Blue Mountains ERUs (map 2-4, in the Introduction to Terrestrial Ecosystems section).

Composition and Structure

Dry grasslands in the project area are dominated by perennial bunchgrasses, such as wheatgrass steppe, fescue grassland, and vegetation types that have the potential to be invaded by dry forest vegetation. Dry grasslands also include crested wheatgrass, an exotic perennial grass that was seeded in the project area to rehabilitate poor condition dry shrubland and provide a dependable grass forage for livestock.

In general, dry grasslands are limited by low rainfall and shallow, rocky, or clay soils. Native dry grassland communities are very diverse, hosting a variety of grasses, forbs, and reeds. In years with good winter or spring moisture, grasslands can be fairly productive, but drought is common. Droughts generally last for three to five very dry years over a ten- to twenty-year period, with moist and dry years scattered in between. Most moisture falls in the cool winter and spring seasons; summers are typically dry. In areas with cloudy or foggy winters, dry grasslands are common, possibly because sagebrush and other shrub species need sunlight in the winter months. Grassland plants depend on storage of winter moisture in soils, because most of their growth is during the spring and early summer. Grassland plants do not have deep root systems needed to tap retreating soil moisture. Therefore, they go dormant until fall rains stimulate another growth period (Terrestrial STAR 1996).

Historical Conditions

Dry grasslands have evolved over the past 10,000 years, and plants and animals that inhabited them lived in a constantly changing environment. Historically, disturbances from climate and fire caused the lowlands to be dominated by sagebrush, and included periods of expansion for grasslands, juniper, and shadscale desert (shrublands with sparse rainfall, vegetation, and shallow soils).

Historically, almost two-thirds of fires in this type were nonlethal, occurring in cured herbaceous-dominated layers. The majority were at less than 25-year intervals. About one-third of fires were mixed severity (a mixture of nonlethal and lethal) at 26- to 75-year intervals.

Current Conditions: Departures in Composition, Structure, and Disturbance Patterns and Processes

Departures in Composition and Structure. This PVG has a high degree of overall departure from historical succession and disturbance regimes. The primary causes of this departure are related to conversion to agriculture and urban use (private lands), improper grazing, invasion of exotics, and changes in fire regimes due to fire exclusion and grazing. Generally this results in lower productivity, higher probability of severe or chaotic events, and lower similarity to the diversity of the native system (for example, noxious weed, cheatgrass encroachment). Large dominant bunchgrasses such as bluebunch wheatgrass and Idaho fescue are being replaced by smaller bunchgrasses such as Sandberg bluegrass, forbs, and exotic species.

Departures in Fire Regime. The current fire regime reflects the encroachment of trees and shrubs, particularly ponderosa pine, Douglas-fir, and mountain big sagebrush, caused by fire exclusion. Presently, only about 55 percent of fires are nonlethal—not very different from historically except that they occur at less frequent intervals. Mixed severity fires occur in about the same proportion and frequency as historically. Fires at longer intervals are more likely to have relatively severe effects on the soil surface and herbaceous plants, particularly when they occur in extremely dry years.

Terrestrial Species and Habitats in Dry Grasslands

General Trends

Species associated with native perennial bunchgrass communities have declined as much or more than any group in the project area. Some associated plant and animal species have been identified as at risk in the Terrestrial Assessment. Some of these species, including the Columbian sharp-tailed grouse, California bighorn sheep, pygmy rabbit, kit fox, and Idaho ground squirrel, need special attention to prevent the need to list them as threatened or endangered. Native grasslands and shrublands have all but disappeared in the Palouse Prairie of Idaho, Mission, Flathead, and Bitterroot Valleys of Montana (Landscape Ecology STAR 1996).

Invertebrates

Little is known about individual invertebrate species, so it is important to provide a diversity of habitat composition and structure to ensure habitat that supports all species is not lost. Some of the common groups of invertebrates include arthropods, mollusks, earthworms, protozoa, and nematodes. Soil structure and chemistry is important for soil invertebrates. Factors that have caused some invertebrate declines include the use of pesticides, loss of litter and dead plant material, and decline in forbs due to grazing, range treatments, fire exclusion, and disturbance of springs, wetlands, talus slopes, caves, and other special habitats (Terrestrial STAR 1996).

Grazing can reduce grass, seeds, forbs, and dead plant material available to invertebrate herbivores and pollinators. Improper livestock use has caused localized soil compaction, especially in wet areas, which has affected soil dwelling species such as earthworms, nematodes, snails, and slugs (Terrestrial STAR 1996). Except for species that are being considered for special species status, impacts from these disturbances on invertebrates are largely unknown. The largest change to invertebrate habitat in non-forested cover types is the conversion of grasslands and shrublands on private land to agriculture for crop production. The resulting simplification of plant species, use of pesticides, and removal of biomass have dramatically altered invertebrate abundance, composition, genetics, and distribution on lands surrounding public lands.

According to species estimates made for the project area (Terrestrial STAR 1996), only about 15 percent of potential invertebrate species have been identified. Of those identified, few have been studied, quantified, or had their ranges mapped. Of the known species, many have been accidentally or intentionally introduced. The small size and mobility of invertebrates make them easy to introduce by vehicles, cargo, animals, wind, and other means. Exotic invertebrate species pose an increasing threat to native invertebrates, through competition, displacement, and interbreeding, and they also pose threats to other plants and animals that they may attack. Invertebrates perform Key Ecological Functions in the environment by decomposing wood and litter that return nutrients to the energy cycle and by serving as food for all other groups of animals. Other Key Ecological Functions of invertebrates including turning over soil and increasing its productivity, pollinating flowers, and dispersing seed (Terrestrial STAR 1996). The scale of the landscape in which invertebrates function is inappropriate for deriving prescriptive management direction for them. (See Introduction to Terrestrial Ecosystems for more discussion of key ecological functions.)

Amphibians

The key for most amphibians is seasonal and permanent wetland habitat, which is a limited habitat in dry grasslands. Salamanders are rare in this potential vegetation group; the tiger and long-toed salamanders are found in wet areas. The Great Basin spadefoot toad, Woodhouse's toad, and spotted frog are limited to wetlands and pond habitat. The introduction of bullfrogs and exotic predatory fish species along with water quality problems have caused a decline in native frog abundance and distribution (Terrestrial STAR 1996). Many constructed ponds, catchments, and spring developments on rangelands have increased frog habitat, but groundwater developments and water diversions into troughs and tanks have altered other habitat areas. The spadefoot toad has been affected by the loss of perennial grassland habitat, increases in bullfrogs, and loss of wetland habitat (Collopy and Smith 1995). Key Environmental Correlates and Key Ecological Functions (See Introduction to Terrestrial Ecosystems section) include helping control insects, turning over soil, creating burrows for other species, and serving as indicators of water quality and quantity (Terrestrial STAR 1996).

Reptiles

Many reptiles are on the northernmost limits of their ranges in the project area and are more common in the Great Basin and Mojave deserts to the south. In general, reptile diversity is high in non-forested areas, but species on the edge of their ranges appear to be especially susceptible to habitat degradation and climate change (Collopy and Smith 1995). Since their habitat in the lowlands is influenced more directly by elevation, aspect, and physical features (rock, talus, terrain, and soil characteristics) than by vegetation, some of the vegetation changes due to overgrazing, exotic species invasion, and fire suppression may not have affected reptiles as much as other species. Common reptiles found in dry grasslands include the common garter snake, western fence lizard, short-horned lizard, yellow-bellied racer, striped whipsnake, gopher snake, and ringneck snake. Highways, reservoirs and other human-created structures are barriers to movement for reptiles and amphibians. Changes in physical features may be more important to these species than changes in vegetation. Reptiles are functionally important as predator and prey species to insects, small mammals, and birds. Key Ecological Functions of reptiles include helping to control rodents and insects, providing food for birds and mammals, and providing burrows for other animals (Terrestrial STAR 1996).

Birds

Some 111 bird species in the project area are associated with dry grasslands; 38 of these birds showed significant declines during population censuses over the past 26 years. Neotropical migratory birds breed and nest within the project area, but winter in south and central America. Thus, a reduction in species may be associated with changes both within and outside of the project area. The greatest impact to birds appears to be the loss of riparian and wetland habitat, but native grasslands may be linked to some species' declines. Riparian vegetation is used by 64 percent of these species. Until recently, killdeer, olive-sided flycatcher, willow flycatcher, red-winged blackbird, western meadow lark, and Brewer's blackbird, showed consistent long-term declines. The two species mainly associated with riparian habitat degradation, the flycatchers, are likely influenced by Federal land management (Neotropical Migratory Bird Report in press 1995, Terrestrial STAR 1996). Recent upward trends may indicate a gradual recovery in riparian habitats (Collopy and Smith 1995), which may account for the recent upward trend in long-billed curlew numbers, although the reasons are unclear. Brown-headed cowbirds and red-tailed hawks have increased in population during the same time period.

Loss of native grasslands and reduction in grassland cover have reduced plant and insect forage, nesting habitat, and hiding cover for several species. Habitat changes have caused declines in Columbian sharp-tailed grouse, upland sandpipers, mountain quail, and grasshopper sparrows (Terrestrial STAR 1996). Sharp-tailed grouse were once a common game bird in several location in Idaho, but the conversion of grass and shrubland to agriculture and loss of native habitats from a wide variety of problems led to the extirpation of these birds in some locations. Sharp-tailed grouse have been reintroduced in one location in southern Idaho, but it is too early to determine if this effort has been successful. Sharp-tailed grouse in southeastern Idaho have recently increased (indicated by increased hunter harvest); it is believed this increase is due to undisturbed grass and shrub habitats created by the Conservation Reserve Program. This program was begun in 1985 to reduced soil erodibility by placing certain agricultural lands in permanent vegetative cover for 10-year periods. Sharp-tail grouse populations not within areas of the Conservation Reserve Program have not experienced similar harvest increases, and populations are currently small and isolated (Hemaker 1995; A. Sands, BLM, pers. comm. 1995).

Improper livestock grazing and increased fire frequency due to the spread of annual exotic species (such as cheatgrass) also may damage nests of ground-nesting birds, such as killdeer and sandpiper, in grassland habitats (Collopy and Smith 1995). Livestock grazing, succession, and increases in fragmentation of habitats have favored the cowbird, a nest parasite of many species. In fragmented habitats the cowbird has an advantage and reduces the reproductive success of other species. Cowbirds appear to be increasing at the expense of other species, by taking advantage of habitat changes. The western meadowlark, loggerhead shrike, lark sparrow, and Brewer's blackbird, important for controlling insects and distributing seeds, have declined (Collopy and Smith 1995).

Low elevation areas have a rich diversity of predatory birds (hawks, eagles, and owls), especially the Owyhee Uplands ERU (Terrestrial STAR 1996). Canyon walls of the Snake River provide nesting habitat for one of the highest densities of predatory birds in the world.

Some earlier declines in predatory birds due to impacts from pesticides, human-caused mortality, capture, and vegetation conversion have been reversed. Some species ~ such as the Swainson's hawk, golden eagle, red-tailed hawk, burrowing owl, ferruginous hawk, peregrine falcon, and bald eagle ~ are showing increases. Loss of riparian vegetation and reduced prey forage due to grazing continue to affect some predatory birds (Collopy and Smith 1995). These predators help control gophers, ground squirrels, deer mice, and other small mammals.

The introduction and expansion of exotic plants, such as cheatgrass, in selected habitats has played a key role in the establishment and expansion of an exotic game bird, the chukar. Conversion of native habitats to croplands, especially for grain crops, has also supported populations of the introduced Chinese pheasant.

Mammals

Seventy-three species, or about three-quarters of the mammal species in the UCRB planning area, use non-forested habitat. Many small mammals rely on grassland ecosystems. Ground squirrels in the area tend to have many subspecies with very narrow distributions, and loss of native plants, poisoning, and soil compaction due to grazing are affecting Idaho ground squirrels and others by reducing available habitat. Conversion to crested wheatgrass and exotic weed species, changes in fire intensity and frequency, and expansion of juniper woodlands have reduced the diversity of small mammals (Collopy and Smith 1995).

Lowlands support a high diversity of bats, which help control insect populations. Bats typically roost in crevices and caves, but structures such as bridges, mines, and buildings have expanded roosting areas for bats. These additional roosting areas may help offset human disturbance to bat habitat, such as from exploration of caves and old mine shafts. Insect control efforts reduce prey for bats. Few bat populations have been monitored and their status is generally unknown (Terrestrial STAR 1996).

Big game species have high social values, as indicated by the amount of money spent annually on wildlife related activities. Elk occupy some areas of the grasslands, especially for winter range. White-tailed deer have benefitted from some human disturbances and have made a western expansion into grasslands in riparian corridors, shrubby riparian areas, and agricultural areas. Competition between livestock and big game has increased where winter ranges are in degraded condition. Livestock grazing management can benefit populations of big game by changing plant species composition, density, and vigor; by providing additional water, salt, and nutrient sources; and by inhibiting the spread of woody vegetation. Livestock grazing management can also have negative impacts to big game if livestock compete for forage and water or increase the spread of disease. Forage competition can be reduced by managing the season of use, intensity of use, and the conversion of shrubs and forbs to annual grasses and other exotic species. Conversion of wintering areas to agriculture and urban areas can intensify conflicts with livestock and ungulates on remaining native low elevation ranges. (See Livestock/Big Game Interaction section, for more information.)

Many of the current high populations of some ungulates can be partially attributed to access management programs that control the use of roads by hunters and selective harvest strategies. Access management strategies among agencies to reduce vulnerability to mortality associated with roads is common for elk management. Increases in the density and use of roads across the project area provide a major factor in human-caused mortality in all big game species (Lyon et al. 1995, Terrestrial STAR 1996).

There are several successful reintroduction of California bighorn sheep populations within the project area, but some sheep reintroduction have been unsuccessful and most historical populations have declined in the Blue Mountains, Owyhee Uplands, and Upper Snake ERUs. Competition and disease transmission from direct contact with domestic sheep and changes in habitat are believed to be the primary causes for decline in bighorn sheep. However, during the winter of 1995–96, a major die-off of bighorn sheep occurred near the Snake river in Hells Canyon which was not attributed to disease transmission from domestic sheep. Bighorn sheep are valued for hunting and viewing opportunities (Lyon et al. 1995).

Fire is an important element in big game range, since it changes the composition and distribution of vegetation. Fire also improves the palatability and nutritional value of forbs, grasses, and some shrubs; and increases early spring green-up, which is important nutrition for pregnant animals. In contrast, fire suppression and change in fire regimes due to exotic plant

invasions have reduced the quality of many big game habitats (Lyon et al. 1995).

Carnivore (predator) populations have fluctuated in response to control efforts and changes in food availability. With the removal of gray wolf and grizzly bears from all but the higher elevation forest areas, coyotes, foxes, and skunks have increased. In some areas, packs of domestic dogs and wolf hybrids are causing increased predation and interbreeding with wild dogs. Mountain lion populations have been reduced in a few areas, especially where there is predation on livestock. The Government-sponsored Animal Damage Control program and non-Government-sponsored activities such as sport hunting and trapping can reduce local populations of carnivores such as mountain lions, coyotes, and other predators. However, overall there has been an increase in lions in the rural interface zone, causing concern for human safety. Any future decline in food ~ especially deer, rabbits, pronghorns, and ground squirrels ~ may cause more carnivores to move into areas with livestock grazing and human habitation (Collopy and Smith 1995, Terrestrial STAR 1996).

Dry Shrub PVG

Potential Vegetation Type (PVT): Dry Shrubs

Antelope Bitterbrush
Basin big sage steppe
Low sage-mesic
Low sage-mesic with juniper
Low sage-xeric
Low sage-xeric with juniper
Wyoming big sage-warm
Wyoming big sage-cool
Salt desert shrub
Three tip sage

Distribution and Description

Dry shrub is currently a major group in the project area, making up 23 percent, compared to 30 percent historically. Within the UCRB planning area, this group makes up 19 percent. Agriculture and urban development have decreased this group by about 30 percent on lands not managed by the BLM or Forest Service; the two agencies manage 55 percent of what is remaining in this group. The majority of this group is found in the Owyhee Uplands, Central Idaho Mountains, and Upper Snake ERUs (map 2-4, in the Introduction to Terrestrial Ecosystems section).

Composition and Structure

As with the dry grassland potential vegetation group, dry shrublands are limited by low rainfall or shallow, rocky, or clay soils. Native plants are diverse, with many species of shrubs mixed in patterns with grasses, forbs, and reeds. Moisture falls primarily in the winter and spring, and most shrubs have deep roots that can tap soil moisture deep in the profile. Evergreen shrubs, such as sagebrush and juniper, continue to grow during winters with favorable moisture and ground temperatures, if there is adequate sunlight to allow photosynthesis.

Historical Conditions

The patterns and composition of shrubs with trees, grasses, and forbs varied historically as climate and fire regimes changed. Historically, grasses and forbs covered 10 to 60 percent of the dry shrublands. Shrubs covered the remaining 40 to 90 percent of the area. The patchy pattern of mixed shrub and grass areas tended to exist in rocky areas and rough terrain. Areas of gentle terrain and deeper soils tended to have more continuous patterns (Terrestrial STAR 1996).

In the absence of fire for long periods, trees, such as juniper and ponderosa pine, sometimes invaded dry shrublands. With frequent fire, grasses and forbs have an advantage because they respond quickly to nonlethal fires by sprouting from bunchgrass root crowns, seeds, or runners whereas tree seedlings are easily killed by most fires. The mixed patterns of trees, shrubs, grasses, and forbs provided a variety of food and cover for animals (Terrestrial STAR 1996).

Historically, 93 percent of fires in the dry shrub PVG were lethal to the dominant shrub overstory, with most (62 percent) occurring at 76- to 150-year intervals. About 6 percent of fires were nonlethal at less than 25-year intervals, likely burning in herbaceous-dominated stages. There was a fire-induced cycle between upland herb and shrub-dominated stages, with no development of early and late seral woodlands.

The native grazing regime appears to have varied from relatively high intensity, short duration grazing by herds of native ungulates, to low intensity grazing by scattered native ungulates animals, to seasonal, moderate levels of grazing by groups of native ungulates. Grazing was strongly influenced by seasonal weather. Grasslands, shrublands, and woodlands were historically mosaics of habitats which were not influenced to any great extent by large grazing animals until horses, and later cattle and sheep, were introduced less than 300 years ago (Collopy and Smith 1995).

Current Condition: Departures in Composition, Structure, and Disturbance Processes and Patterns

Departures in Composition and Structure

Similar to the dry grass PVG, this group has a high degree of overall departure from historical succession and disturbance regimes. The primary causes of this departure relate to conversion to agriculture and urban use, improper grazing, and changes in fire regimes attributable to exclusion and grazing. This generally results in lower productivity, higher probability of severe or chaotic events, and lower similarity to the diversity of the native system (for example, noxious weed, cheatgrass encroachment).

Since implementation of fire exclusion, improper livestock grazing, invasion of exotics, and conversion to agricultural and urban land use, this type has gone through significant change. Exotics are common components in most plant communities of this group. Woodlands have not increased significantly. The most profound effect is the general change in composition and structure within the upland shrub and herb plant communities as a result of heavy early season or season-long livestock grazing and seeding to perennial exotic grasses, especially crested wheatgrass.

Departures in Fire Regime

Averaged for the entire dry shrub group, the current fire regime has not changed much from the historical regime. However, fire frequency has increased in locations where exotic annual grasses have invaded.

Currently about 11.5 percent of fires are nonlethal. Eighty-four percent of the area has a lethal fire regime. Fire frequency is still 76 to 150 years in 38 percent of the area, but it has increased in 43 percent of the area to less than 25 years. This must be at least partially caused by the current dominance of exotic annual grasses in many locations.

Rare, Endemic, and Special Dry Shrub Habitats

Certain areas were identified in the Terrestrial Assessment as having several plant or animal species that are rare and/or have very limited distribution (narrow endemics; see map 2-5, in the introduction to Terrestrial Ecosystems). These areas include salt desert shrub and other dry shrub habitats in Idaho. Only small remnant salt desert shrub areas exist on BLM-

Photo 11: The dry shrub PVG is currently a major group in the UCRB planning area (about 19 percent). M. Pellant photo.

administered lands, although several rare species need these habitats. Important habitat also includes some of the dry shrublands in Owyhee Uplands ERU. These not only contain remnant habitat areas on BLM- or Forest Service-administered lands, but also have thermal hot springs, potholes, lava flows, caves, alkali lakes, and other limited habitats. There are also important habitat areas in the canyons and uplands surrounding the Upper Snake River ERU on the border between Oregon, Idaho and Nevada. This area has remnant dry shrublands and perennial grasslands on BLM-administered lands, and it is also on the convergence with the Great Basin, Klamath, Cascade, and Rocky Mountain species ranges. The Snake River Canyon creates unique microsites (small, local variations in habitat) and acts as a corridor to some species moving in the canyon, while posing a barrier to others trying to cross it.

Areas with relatively intact native populations of species with high biodiversity were also identified in the Terrestrial Assessment (see Map 2-6, in the introduction to Terrestrial Ecosystems). Dry shrublands in Idaho are included because they represented some of the last relatively large undisturbed shrub habitat that has not been converted to agriculture. The lower Snake River, areas in north central Idaho, and the Continental Divide areas of Montana also contain many different species. The uplands are also in this category due to the high number of native species, some of which are on BLM lands and wildlife refuges (U.S. Fish and Wildlife Service). These areas represent sources of plant and animal species to recolonize neighboring habitat areas, as well as important areas for research and monitoring (Terrestrial STAR 1996).

Terrestrial Species and Habitats in Dry and Cool Shrublands

Terrestrial species and habitat sections for the dry and cool shrublands have been combined for ease of discussion. Most of the animal species that exist in the dry shrublands also exist in the cool shrubland and move between the two habitats based on annual weather and climate changes. An example may be a species that needs shrubs for nesting such as the Brewer's sparrow. This species will not nest in trees or on the ground in grasslands but can be located in both the dry and cool shrubland types. Some information from the Terrestrial Assessment data bases was able to separate species within these two shrubland habitat groupings; when possible, this separation will appear in the text of this section.

Amphibians

The key for most amphibians is seasonal and permanent wetland habitat, which is a limiting factor in the dry shrublands. Salamander diversity is low, with three species, and probably always was in dry shrublands of the project area. Frog diversity is higher with six frog species and two toad species in the project area. The cooler climate of cool shrublands limits amphibians. Two species of salamanders are found in cool shrublands and have probably always been rare in this group.

Birds

Dry shrublands support some 93 bird species, which increases to 132 if riparian and wetland areas are included within this type. Over the past 26 years, surveys of banded birds show some populations trends. For example, population increases of birds that use riparian areas within dry shrublands ~ such as MacGillivray's warbler, killdeer, olive-sided flycatcher, willow flycatcher, Brewer's blackbird, western meadowlark, and Lazuli bunting ~ have increased, indicating some recovery in riparian systems. Northern flicker, house wren, mountain bluebird, American robin, and grey flycatcher also have increasing population trends, partly due to expansion in juniper woodland habitat (Collopy and Smith 1995).

Declines in species such as sage grouse, Brewer's sparrows, and sage sparrows can be attributed to changes in shrubland structure, abundance, and distribution. Habitat is becoming more and more disjunct (areas have become isolated from each other), and blocks of habitat are becoming smaller islands. Changes in riparian and wetland habitat, and native grasslands, are also linked to some species declines. Loss of grass and shrub cover, and loss of structural diversity, have significantly reduced plant and insect forage, nesting habitat, and hiding cover for several species, including declines in sage grouse, sharp-tail grouse, upland sandpipers, mountain quail, and grasshopper sparrows (Terrestrial STAR 1996). The expansion and increased density of juniper woodlands has caused the deterioration of sagebrush and grassland habitats which appears to have affected the rock wren and chipping sparrow (Collopy and Smith 1995).

Sage grouse were once common across southern Idaho and northern Nevada. Some populations

have declined based on harvest records and other information. The loss and fragmentation of shrubland due to conversion to agriculture has been common in the Upper Snake ERU and to a lesser extent in Owyhee Uplands. Also, this habitat is additionally fragmented because of recent extensive fires and increases in exotic weeds and other problems. The problem is complex because sage grouse also need grass, forbs, and insects, especially in the spring when they raise their young; sage grouse populations are in decline (Collopy and Smith 1995).

Mammals

Seventy-two species of mammals use the dry shrub potential vegetation group (Terrestrial Staff database). Many small mammals rely on the sagebrush steppe and grassland ecosystems. Several ground squirrels in the area have subspecies with very limited distributions. Loss of native plants, rodent poisoning, and soil compaction due to improper grazing are affecting several species such as Washington and Idaho ground squirrels, pygmy rabbits, and white-tailed jackrabbits. The pygmy rabbit is considered a special status species because of its rapid decline. This rabbit's survival is linked to critical remnant areas of shrub steppe vegetation, which is declining because of conversion to crested wheatgrass, extensive planting of introduced grasses (1.4 million acres in Idaho), introduction of exotic weed species, and changes fire intensity and frequency. Increased density of juniper woodlands has reduced sagebrush and bunchgrass understory, which may reduce habitat diversity for small mammals in dry shrublands (Collopy and Smith 1995).

About 66 species of mammals use cool shrublands (Terrestrial Staff database). Conversion to agriculture, invasion of exotic weed species, changes in fire intensity and frequency, and expansion and increasing density of juniper woodlands may negatively affect some small mammals (Collopy and Smith 1995). Bushy-tailed woodrats, yellow-bellied marmots, mantled ground squirrels, northern pocket gophers, and deer mice are common mammals that provide food for predatory birds and mammals and help distribute seeds and spores of plants. Porcupines use cool shrublands extensively and help limit the invasion of conifers and other trees into this type.

Like most native ungulates, populations of pronghorn antelope were decimated by unregulated hunting between 1850 and 1920. Since then populations have increased because of regulated hunting and improved range conditions. Available pronghorn habitat has been affected by loss of habitat, fire suppression, increase in coyotes and dogs, transportation systems, human habitation, grazing, and fencing that is not compatible with pronghorn movements (Lyon et al. 1995). Populations of this lowland species have become more disjunct (populations have become isolated from each other), and blocks of habitat are becoming islands.

Populations of the bobcat and other fur-bearing species appear to be increasing with reductions in demand for their fur. Bobcats have an important interaction with black-tailed jackrabbits and cottontail rabbits in the shrub steppe areas, and may help to reduce crop damage during periods of high jackrabbit population cycles (Collopy and Smith 1995). In some areas, packs of domestic dogs and wolf or coyote hybrids are causing increased damage to livestock and big game herds.

For more information on terrestrial invertebrates, reptiles, and carnivore species, see the Dry Grasslands Potential Vegetation Group.

Cool Shrub PVG

Potential Vegetation Type (PVT): Cool Shrub

Mountain big sage-mesic-east
Mountain big sage-mesic-east with conifer
Mountain big sage-mesic-west
Mountain big sage-mesic-west with juniper
Mountain shrub

Distribution and Description

The cool shrub PVG is somewhat a minor group in the project area, occupying 8 percent of the project area compared to 9 percent historically. Within the UCRB planning area, this group makes up 9 percent. The cool shrub PVG has declined by about 11 percent as a result of agriculture and urban development on non-Federal lands; the BLM or Forest Service manages 66 percent of what is remaining of this group. This group is found in nearly every ERU with the majority of the group found in the Blue Mountains, Central Idaho Mountains, Owyhee Uplands, Snake Headwaters, and Upper Snake ERUs (map 2-4, in the Introduction to Terrestrial Ecosystems section).

Photo 12: The cool shrub PVG is generally limited by shorter growing seasons and lack of late summer moisture. USFS photo.

Composition and Structure

The cool shrub PVG is represented by mountain big sagebrush and mountain shrub potential vegetation types. This PVG is generally limited by shorter growing seasons and lack of late summer moisture. Soils are often shallow, rocky, or high in clay content, which limits soil moisture and encroachment of trees in some areas. Historically, cool shrublands had fairly short cycles of dominance by either grasses and forbs or by shrub species.

Historical Conditions

Grasslands, shrublands, and woodlands were historically mosaics of habitats that were not influenced greatly by large grazing animals until horses, and later cattle and sheep, were introduced less than 300 years ago (Collopy and Smith 1995). The native grazing regime appears to have varied from relatively high intensity, short duration grazing by herds of big game animals, to low intensity grazing by scattered animals, to seasonal, moderate levels of grazing by groups of game animals. Grazing was strongly influenced by seasonal weather.

Historically, about 82 percent of the fires in this type were lethal to the dominant shrub overstory, with 62 percent occurring at intervals of 25–75 years. About 15 percent of acres were burned by nonlethal fires, occurring in herbaceous vegetation at intervals of less than 25 years, particularly in the Central Idaho Mountains ERU.

Grasses and forbs covered from 10 to 40 percent of the cool shrub, and shrubs covered the remaining 60 to 80 percent, depending on the occurrence of fire. Conifers occupied from about 3 to 10 percent of the area of the cool shrub PVG.

Current Condition: Departures in Structure, Composition, and Disturbance Processes and Patterns

Departures in Structure and Composition

This group has a high degree of overall departure from historical succession and disturbance regimes. The primary causes of this departure relate to improper grazing, changes in fire regimes due to exclusion and grazing, and exotic forb and grass dominance. This generally results in lower productivity, higher probability of severe or chaotic events, and lower similarity to the temporal, spatial, and habitat diversity of the native system (for example, noxious weed encroachment). Where declines have occurred, the large dominant bunchgrasses have generally been replaced by native forbs and by exotic forbs and grasses such as Kentucky bluegrass. Woodlands have increased to cover 25 to 30 percent of cool shrublands, and upland grass and forb areas have generally been lost, with only four percent remaining.

Departures in Fire Regime

The current fire regime is 86 percent lethal fires and 9 percent mixed severity, reflecting the

decrease in grass- and forb-dominated stages to only about 4 percent, and the increase in woodlands. Nonlethal, very frequent fires have declined to about 6 percent of total burned acreage. Invading conifers include western juniper, particularly in the Blue Mountains and Owyhee Uplands ERUs; Douglas-fir (Gruell 1983) and ponderosa pine in southwestern Montana; and Douglas-fir and lodgepole pine in eastern Idaho.

Terrestrial Species and Habitats in Cool Shrublands

See discussion under "Terrestrial Species and Habitats in Dry and Cool Shrublands."

Key Factors Influencing Rangeland Vegetation

Major elements that influence how rangeland vegetation appears include: (1) livestock grazing; (2) fire and fire exclusion; (3) introduction of noxious weeds, exotic plants and introduced forage grasses; (4) Soils and their productivity; and (5) climate. These elements act together to create the vegetation patterns seen on the landscape.

Although vegetation in the project area has always been grazed by herbivores, the introduction of large numbers of livestock into the region in the late 1800s subjected the vegetation to stresses with which it had not adapted. Fire, sometimes fanning out over large expanses of rangeland, was frequent before the arrival of Europeans. The introduction of livestock resulted in consumption of a portion of the vegetation that had provided fuel for fires. Fire frequency declined in some areas as a result of this and because of subsequent fire suppression efforts in some places. Plant communities formerly composed of native species are now being converted in many areas to exotic weed species. Most of these exotic plants require some sort of disturbance to become established, but once established they will often displace native species.

Soils and their productivity are integral to the productivity of rangeland plants and to plant composition within communities (figure 2-13). Soil productivity depends on both soil (for example, depth, texture, supply of nutrients) and non-soil (for example, slope and rainfall) factors, and these factors vary greatly across rangelands. Certain rangeland soils are fertile, but because of low rainfall are not highly productive of vegetation. Some rangeland soils are shallow and do not retain soil water for long periods of time, thus these soils are not highly productive either. See Soils section of the Physical Environment section earlier in this chapter for a more in-depth discussion on soils.

Climate, especially drought, is a frequent but unpredictable force that plays a major role in the pattern, composition, and structure of vegetation. The effects of livestock grazing, fire or its exclusion, exotic plants, soils and their productivity, and other factors that alter vegetation are only fully expressed if climate is considered, because climate governs the full response of vegetation.

Livestock Grazing

Rangeland vegetation in the Intermountain West, including the project area, adapted to relatively light grazing pressure compared to the vegetation of current times and to the vegetation in the Great Plains. Although large herbivores were present in the project area prehistorically, we do not have accurate estimates of the prehistoric population sizes of the various herbivores and their distributions on the land, especially compared to historical and current livestock numbers and distributions. Historical and prehistorical herbivory, as proposed by Burkhardt (1994, in Leonard and Karl 1995a) was strongly influenced by seasonal weather on Intermountain rangelands. Under this scenario, low elevation valleys were grazed in winter. Herbivores moved to higher elevations in spring with growth of herbaceous species, permitting regrowth in the lower elevations in spring and early summer and fuel accumulation for periodic summer fire. The animals then moved back to lower elevations in fall. The native wild ungulate grazing regime included relatively high intensity, short-duration grazing by herds; low intensity grazing by scattered animals; and seasonal moderate levels of grazing by groups of animals.

Horses were introduced by humans about 300 years ago, and cattle and sheep were introduced later when extensive settlement of the West began. Unlike wildlife species, livestock do not migrate. Livestock tend to stay in place as long as they have food, water, and other needs; this can damage vegetation, soils, streams, and other resources. Current land ownership patterns and grazing permits (forage allocations on grazing

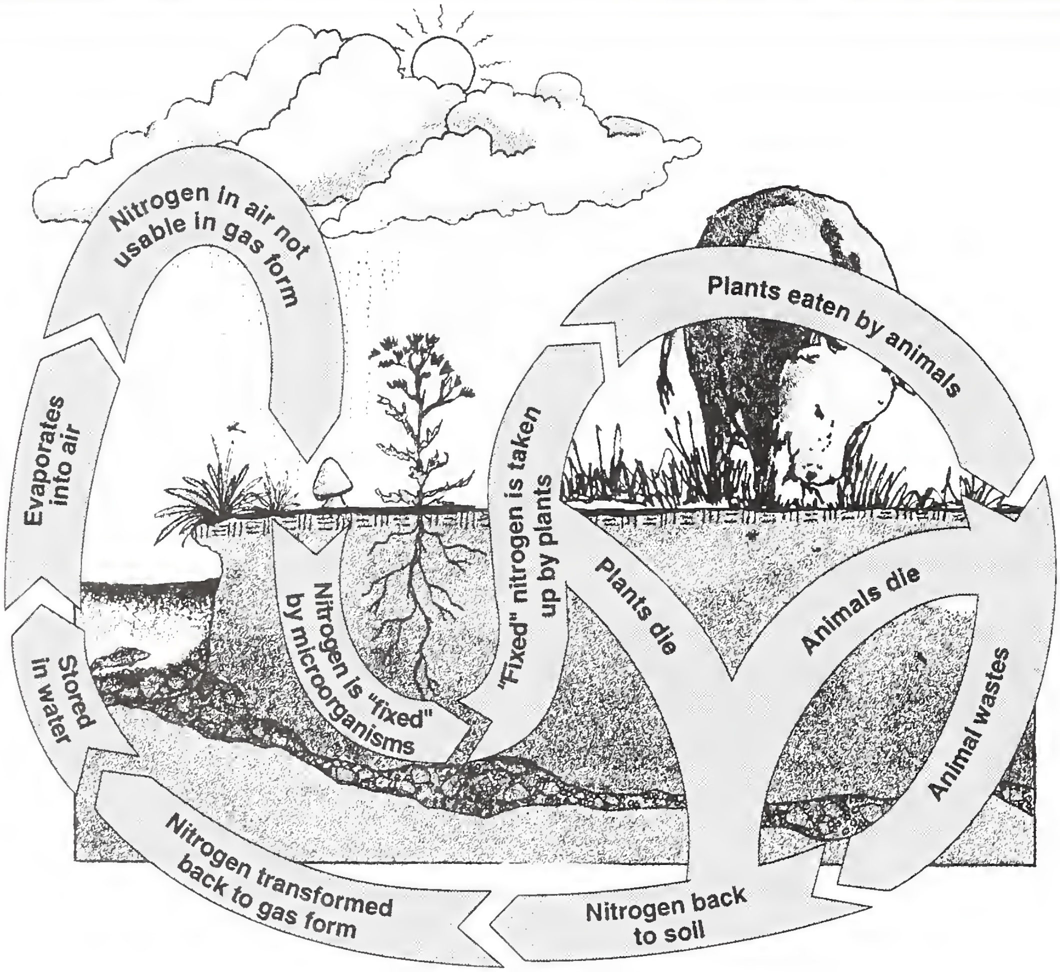


Figure 2-13. Nitrogen Cycle and Rangeland Health.

Plants depend not only on energy captured through photosynthesis but also on nutrients in soil. Nutrients such as nitrogen are cycled continually among plants, animals, and microorganisms. The amount of nitrogen available and the rate at which it cycles is a fundamental factor in rangeland health.

After water, nitrogen is the most limiting factor in rangeland ecosystems because nitrogen in the air must be captured and transformed (or "fixed") by specific bacteria or algae into a form useable for biological processes. Legumes (such as peas, clover, beans) and a few other plant species host specific nitrogen-fixing organisms in their root hairs, producing a root enlargement called a nodule, where the conversion of gaseous nitrogen to useable forms occurs. Other species of bacteria and fungi decompose organic materials such as plant litter or dead animals, reincorporating previously fixed nitrogen into the soil where it can be used by plants and other organisms through the nutrient cycling process.

A close, interdependent relationship exists between nitrogen and carbon. The proportions of each element play an important role in regulating the decomposition rate of organic matter and in controlling the rate at which nitrogen and other nutrients are cycled (Debano 1990). Therefore, factors that affect the nitrogen cycle will also have effects on the functioning of the carbon cycle (see figure 2-12 in the forestlands section).

A variety of conditions prevalent on rangelands within the UCRB planning area contribute to reduction or loss of useable nitrogen. One such condition is soil erosion, which reduces the total organic matter available and thus the potential total nitrogen content of the soil. Another observed condition is the conversion of sites to monocultures of shallow-rooted (often exotic) species, which affects the depth to which plant roots can deposit nitrogen in the soil (National Research Council 1994).

Nitrogen and other nutrient and biophysical cycles are key ecological processes in every ecosystem type and are inextricably woven together through and across ecosystem boundaries. The nitrogen cycle is discussed here to highlight its importance to rangeland health, but it also is critical to forest and aquatic/riparian health.

allotments) add complications that make it difficult for livestock to move seasonally and thereby graze rangelands as they probably were grazed historically. The sedentary behavior currently observed of livestock in riparian areas would have been discouraged in wild herbivore populations by the abundance of predators.

Current scientific thinking regarding livestock grazing pressure and its relation to vegetation succession typically falls into two general categories of models. The first and older model of vegetation succession is the traditional "climax" model. The second, and more recent model is the "state and transition model". The climax model asserts that reduction or elimination of livestock grazing pressure will permit improvement in rangeland vegetation through secondary succession. Range scientist are beginning to accumulate convincing evidence, however, that not all rangeland vegetation types respond according to the climax model. Relatively new models, of which the "state and transition" model of vegetation succession regarded by Laycock (1994, in Leonard and Karl 1995a) as most useful, have been proposed as operative on many arid and semiarid rangeland vegetation types. See Appendix F for a more detailed discussion of these two models.

Grazing management in the project area has been guided by principles of the climax model during the 20th century. Potential vegetation types on rangeland in the project area that best fit this model of successional advancement of vegetation succession include: (1) all riparian types (willow/sedge, Saltbrush Riparian, Mountain Riparian Low Shrub, Riparian Graminoid, Riparian Sedge, Cottonwood Riverine, and Aspen); (2) grasslands, (such as Agropyron Steppe, Fescue Grassland, and Fescue Grassland with Conifer); (3) cool shrub types (such as Mountain Big Sagebrush, Mountain Shrubs); and (4) open ponderosa pine-grasslands (such as Interior Ponderosa Pine). There are exceptions within these types where improvement may not be observed, especially in cases of extreme past grazing abuse, noxious weed invasion, and within the drier portions of these vegetation types that are adjacent to even drier vegetation types such as Wyoming Big Sagebrush.

Succession of vegetation in some places and vegetation types does not necessarily parallel changes in livestock grazing pressure. For example, arid and semiarid potential vegetation types on rangeland can remain stable at a successional stage lower than climax for long periods of time after reduction or elimination of livestock grazing pressure. These vegetation types apparently fit the state and transition model more so than the climax model. Examples of these vegetation types include dry sagebrush steppe potential vegetation types, with or without juniper (that is, Basin Big Sagebrush, Wyoming Big Sagebrush, and Low Sagebrush), and Salt Desert Shrub. In much of the Intermountain Region, past livestock grazing pressure probably has contributed to increased dominance of sagebrush species and to encroaehment or increased dominance of juniper (Archer 1994, in Leonard and Karl 1995a). This occurs through modification of the following: microclimate, plant competitive interactions, soil fertility, and fire frequency and severity caused by livestock consumption of grasses and forbs that acts as fuel. Reduction or elimination of livestock grazing pressure will not necessarily convert dominance by woody plants to dominance by grasses and forbs, especially on sites with dense woody plant cover and sparse grass and forb understory. Adjustments in livestock grazing pressure or rest from livestock grazing can, however, result in improved soil stability, soil water levels, and nutrient levels, especially on sites that have yet to reach a peak in woody plant cover. In the project area, an example of increased dominance by woody plants is the expansion of western juniper, which is most notable in Upper Klamath, Northern Great Basin, Columbia Plateau, Blue Mountains and Owyhee Uplands ERUs. Further discussion of this topic can be found in "Western Juniper and other Woody Species Expansion/Density Concerns," later in the rangelands section.

Some potential vegetation types, especially Wyoming big sagebrush warm and more recently salt desert shrub, are susceptible to invasion by exotic annual grasses such as cheatgrass and medusahead, which are flammable. If they dominate a site, a deceptively stable vegetation state results, because these flammable exotics create fire-return intervals as low as five years, which do not permit perennial grasses or shrubs to establish and produce seed, even if a seed source is nearby. Reduction or elimination of livestock grazing pressure can make the situation worse by allowing grass and forb plant material to accumulate and provide fine fuels for fire. These conditions of flammable exotics are found in the more arid portions of the UCRB

planning area, especially the Owyhee Uplands and Upper Snake ERUs.

Achieving the goal of sustainability of the rangeland resource with grazing management should involve stocking rates and grazing intensities compatible with drought frequency and magnitude. Flexibility within the grazing system is required as part of any grazing strategies intended to prevent rangeland vegetation from becoming more degraded, especially because of climate variability on rangeland. In this regard, continued stocking at near normal levels during moderate to severe drought is probably the greatest cause of range deterioration (Vallentine 1990, in Leonard and Karl 1995a).

The potential for drought-related damage to rangelands in the project area is high, especially in dry shrublands such as Wyoming sagebrush sites in the Owyhee Uplands and Upper Snake ERUs. Drought-related degradation is a concern on BLM-administered lands where livestock are normally already out on the range before it is realized that a drought is in effect. By the time a drought is inevitable, livestock have been out on the range for months, and the ability for most livestock operators to round up their cattle and take them to another area or home is limited. Therefore, much effort has been taken to try and accommodate cattle on BLM-administered lands, which increases the potential for drought-related damage to the dry shrubland types. Reduced grazing pressure during drought and for some time after drought may be necessary to minimize damage and hasten recovery of perennial vegetation.

For a detailed discussion of livestock grazing in riparian areas, see the Aquatic Ecosystems section of this chapter.

Changes in Fire Regimes

Alterations in natural fire regimes have greatly influenced the location, composition, and structure of rangeland vegetation. In many locations the frequency of fire has decreased because of fire suppression and removal of carrier fuels by livestock grazing. Changes resulting from decreased fire frequency include: (1) encroachment of conifers into non-forested vegetation at the forest-steppe boundaries, for example ponderosa pine and Douglas-fir; (2) increased tree density in former savanna-like stands of juniper and ponderosa pine; and (3) increased density and/or coverage of big sagebrush and other shrubs, with accompanying loss of herbaceous vegetation. In contrast, fire frequency has increased in other areas, particularly in drier locations where exotic annual grasses such as cheatgrass have become established. These changes in the fire regime have caused greater homogeneity or simplification of many landscapes.

Increased fire frequency has caused a loss of shrub cover, particularly sagebrush and bitterbrush, and reduction in bunchgrasses. At the same time, frequent fire has favored dominance by exotic annual grasses. More fuel for fires accumulates under encroaching shrubs and trees or in grasslands where fires have been suppressed and grazing has not helped remove build-up in plant material. This added fuel makes it more likely that future fires will be lethal and will kill the root crowns of bunchgrasses, which will make it easier for exotic species, annuals, and conifers to displace native grasses.

In dry grasslands where fire typically has been absent, shrubs are more competitive than grasses, in part because shrubs have deeper root systems than grasses, allowing them to tap soil moisture in dry years. When dry grassland sites are invaded by shrubs or trees, soil characteristics and nutrient cycling that developed under grassland ecosystems are disrupted. Cover on the soil (vegetation and litter) decreases, which in turn exposes more soil to erosion (Landscape Ecology STAR 1996). Improper grazing of the remaining grasses and forbs can further expose the soil, and erosion by wind and water can lead to permanent gully formation and changes in water tables.

Noxious Weeds, Exotics, and Introduced Forage Grasses

Noxious Weeds

The beginning of agriculture, including livestock grazing in the project area, permitted introduction of seeds of exotic plants onto rangelands. Today, exotic plants, including legally declared "noxious weeds," are spreading rapidly and in some cases exponentially on rangeland in every ERU in the project area. The establishment and spread of these species is fostered by disturbance to the soil surface. Noxious weeds, in general, are opportunists.

Photo 13: Increased fire frequency has caused a loss of shrub cover, particularly sagebrush and bitterbrush, and reduction in bunchgrasses. Frequent fire also has favored dominance by exotic grasses, which provide more fuel for fires and make it more likely that future fires will be lethal. USFS photo.

They are typically prolific producers of seed, which are usually dispersed often for long distances by vehicles, wind, wildlife, livestock, water, machinery, and pack animals. Noxious weeds are commonly referred to as "pioneer" species because after a disturbance to the soil surface which results in loss of the native plant cover, they are often the first species to arrive and colonize. They typically germinate under a wide variety of conditions, and show fast seedling growth; thus, they establish quickly and take up water and nutrients that become unavailable for native species. Some noxious weed species, however, currently are showing ability to invade relatively undisturbed sites as well, including Wilderness Areas. Some of the densest infestations of noxious weeds are near roads, which provide a route for spread of noxious weeds by human-related actions and for an increase in the amount of exposed bare ground. Noxious weeds can reduce the diversity and abundance of native vegetation, reduce forage, reduce diversity and quality of wildlife habitat, increase erosion, and decrease water quality.

Many noxious weeds already are present on rangelands in nearly every county of the project area. These weeds include: bull thistle, Canada thistle, dalmatian toadflax, diffuse knapweed, hoary cress (whitetop), leafy spurge, musk thistle, Russian knapweed, Scotch thistle, spotted knapweed, yellow starthistle, and yellow toadflax. Many of these same weeds are also a problem in forest areas, as discussed in the introduction to this chapter. Rangeland cover types (plant communities) in the project area that have declined in area from historic to current, partly because of the invasion by noxious weeds, can be found in table 2-11. Weeds that are relatively recent invaders or soon will be new invaders of rangeland in the project area, and are of critical concern to weed experts, include but are not limited to: Syrian bean-caper, African rue, Iberian starthistle, purple starthistle, distaff thistle, squarrose knapweed, camelthorn, saltcedar, and matgrass.

Dewey et al. (1991) propose that "The precision and usefulness of federal weed control Environmental Assessment (EA) and Environmental Impact Statement (EIS) documents would be significantly improved by knowing the exact location and extent of lands vulnerable to specific noxious weeds." In this regard, a measure of the susceptibility of rangeland cover types to invasion by 25 weed species (24 noxious weeds plus cheatgrass) is presented in Karl et al. (1995) along with regional (Washington, Oregon, Idaho, Montana, and Wyoming) distribution maps of these 25 species at the county scale. These county maps show the distribution of each species over the past 121 years (1875–1995). The susceptibility of rangeland cover types to invasion by noxious weeds and cheatgrass was coded and defined as follows: (1) Disturbed = moderate susceptibility - cover type is susceptible to invasion by weed species following disturbance that affects the soil surface or removes the canopy cover; (2) Invasive = high susceptibility - cover type is susceptible to invasion by weed species even in the absence of disturbance; (3) Closed = negligible susceptibility - cover type does not provide suitable habitat for the weed species to typically

Table 2-11. Rangeland Cover Types (plant communities) in the Project Area That Have Declined in Area from Historical to Current, In Part Because of the Noxious Weeds Listed for Each Type.

Rangeland Cover Type	Associated Potential Vegetation Group[1]	Noxious Weeds
Agropyron Bunchgrass	Dry Grass	diffuse knapweed, spotted knapweed, yellow starthistle, rush skeletonweed, sulfur cinquefoil, medusahead, Dyers woad, dalmatian toadflax, yellow toadflax, common crupina
Fescue-Bunchgrass	Dry Grass	spotted knapweed, leafy spurge, sulfur cinquefoil, oxeye daisy
Antelope Bitterbrush-Bluebunch Wheatgrass	Dry Shrub	diffuse knapweed, cheatgrass[2], dalmatian toadflax, rush skeletonweed, sulfur cinquefoil
Big Sagebrush	Dry Shrub	cheatgrass[1], medusahead, diffuse knapweed, rush skeletonweed, dalmatian toadflax, Dyers woad, Mediterranean sage, yellow starthistle
Herbaceous Wetlands	Riparian Herb	Kentucky bluegrass[1], Canada thistle, purple loosestrife, leafy spurge, saltcedar, musk thistle, Russian knapweed, spotted knapweed, Scotch thistle, yellow starthistle, hoary cress (whitetop), Mediterranean sage
Shrub Wetlands	Riparian Shrub	Canada thistle, leafy spurge, musk thistle, purple loosestrife, saltcedar, Russian knapweed, Mediterranean sage

[1] Column two shows the associated potential vegetation group in which the cover type resides.
[2] Not legally declared noxious in project area.

invade; and (4) Unknown = negligible susceptibility - data were insufficient to allow a determination of susceptibility.

Appendix F includes tables called *SUSCEPTIBILITY* and *COVER TYPE*, which display the information on susceptibilities of the rangeland cover types, for the use of land managers and the concerned public. These rangeland cover types are described in table *COVERTYPE* and are recognized by the Society for Range Management. Rangeland cover types are plant communities characterized by the existing vegetation on the area. Thus these cover types represent the vegetation that is on the ground and are useful for land managers and others who are interested in searching for and controlling infestations of these weeds. The rangeland cover types that are coded as moderate or high susceptibility in table *SUSCEPTIBILITY* are what are referred to in the standards of the noxious weed section of Chapter 3. Information from tables *SUSCEPTIBILITY* and *COVER TYPE* is summarized here in table 2-12. Table 2-12 shows, for each of 15 selected noxious weed species assessed in Karl et al. (1995), the rangeland cover types that are most susceptible to invasion.

Specific location and current acreage information is not available for the project area at this time for noxious weeds. In addition, susceptibilities of rangeland cover types to each weed, in table *SUSCEPTIBILITY*, will require further revision as

more knowledge becomes available. Predicting noxious weed distributions in the future requires that we know specifically what rangeland cover types are susceptible to invasion by each weed and where these types lie on the landscape in relation to where the noxious weeds are currently distributed.

Noxious weed control on BLM- or Forest Service-administered lands generally has been ineffective. Limited budgets; lack of consistency and coordination by all concerned entities such as private, county, State, and Federal; and an inability to get ahead of the weed problem have allowed noxious weeds generally to continue to spread throughout the project and planning areas. Control methods have focused on mechanical and chemical efforts usually along major roads and Rights of Way, as funding allows. Both large and small noxious weed infestations have been the focus of efforts in the past, mostly treated through contracts with the counties. In some cases, noxious weeds are treated by qualified Federal agency personnel of the administering agencies. The cheapest, most effective, and highest priority weed management technique is prevention, especially prevention of new infestations of noxious weeds and establishment of new exotic weeds not currently residing in the region. The magnitude and complexity of noxious weeds on rangelands in the project area, combined with their cost of control, necessitates using Integrated Weed Management (IWM). Integrated Weed Management involves the use of several control techniques in a well-planned, coordinated, and organized program to reduce the impact of weeds on rangelands. The IWM strategy is discussed in more detail in Appendix F.

Exotics: Altered Sagebrush Steppe

(Primarily taken from Pellant 1995.)

Altered sagebrush steppe represents a landscape where invasion of exotic annual grasses and forbs into some sagebrush communities has resulted in plant communities where native perennial plants are lacking and annuals dominate the site. Past overgrazing of the perennial grasses and forbs in these sagebrush communities made these areas more susceptible to invasion from exotic annuals such as cheatgrass, medusahead, Russian thistle, and mustards. As the annuals increased in these communities, so did the fire frequency. Where these sagebrush communities would normally burn every 25–100 years in the past, they now can burn every five years as a result of the dominance of annuals. This short-duration fire cycle, in combination with overgrazing, reduces the presence of perennial plants in the community and increases the dominance of annuals. In addition, adjacent areas susceptible to invasion from annuals also can burn, which expands the size of the annual-dominated rangeland. Invasion of annuals is most serious in the Owyhee Uplands and Columbia Plateau ERUs, where cheatgrass has literally taken over some range sites.

Cheatgrass is an annual grass that was probably introduced to western rangelands via contaminated grain from Europe in the late 1890s. Currently, cheatgrass exists in every county within the project area. Given its high seed production and highly germinable seed, cheatgrass is a successful intruder of native plant communities that are under stress or have been disturbed. The litter and standing dead

Photo 14: Altered sagebrush steppe represents a landscape where exotic annual grasses and forbs have invaded sagebrush communities. Photo by USFS.

Table 2-12. Noxious Weeds in the Project Area[1].

Noxious Weed	Rangeland Cover Types Most Susceptible to Invasion
Bull Thistle	Idaho Fescue Idaho Fescue-Bluebunch Wheatgrass Idaho Fescue-Slender Wheatgrass Idaho Fescue-Threadleaf Sedge Rough Fescue-Bluebunch Wheatgrass Rough Fescue-Idaho Fescue Riparian
Canada Thistle	Idaho Fescue Alpine Idaho Fescue Idaho Fescue-Bluebunch Wheatgrass Idaho Fescue-Slender Wheatgrass Idaho Fescue-Tufted Hairgrass Rough Fescue-Bluebunch Wheatgrass Rough Fescue-Idaho Fescue Riparian Aspen Woodland Tufted Hairgrass-Sedge
Dalmatian Toadflax	Bluebunch Wheatgrass Bluebunch Wheatgrass-Sandberg Bluegrass Idaho Fescue Idaho Fescue-Bluebunch Wheatgrass Curlleaf Mountain Mahogany
Cheatgrass[1]	Bluebunch Wheatgrass Bluebunch Wheatgrass-Sandberg Bluegrass Idaho Fescue Idaho Fescue-Bluebunch Wheatgrass Idaho Fescue-Slender Wheatgrass Rough Fescue-Bluebunch Wheatgrass Rough Fescue-Idaho Fescue Antelope Bitterbrush-Bluebunch Wheatgrass Antelope Bitterbrush-Idaho Fescue Bitterbrush-Bluebunch Wheatgrass Bitterbrush-Idaho Fescue Bitterbrush-Rough Fescue Big Sagebrush-Bluebunch Wheatgrass Big Sagebrush-Idaho Fescue Big Sagebrush-Rough Fescue Mountain Big Sagebrush
Dyers Woad	Bluebunch Wheatgrass Bluebunch Wheatgrass-Sandberg Bluegrass Idaho Fescue-Bluebunch Wheatgrass Idaho Fescue-Slender Wheatgrass Idaho Fescue-Threadleaf Sedge Rough Fescue-Bluebunch Wheatgrass Rough Fescue-Idaho Fescue

Noxious Weed	Rangeland Cover Types Most Susceptible to Invasion
Dyers Woad (continued)	Basin Big Sagebrush Crested Wheatgrass Black Sagebrush Low Sagebrush Bluegrass Scabland Stiff Sagebrush Wyoming Big Sagebrush Big Sagebrush-Bluebunch Wheatgrass Threetip Sagebrush-Idaho Fescue Threetip Sagebrush Big Sagebrush-Idaho Fescue Big Sagebrush-Rough Fescue Mountain Big Sagebrush Bittercherry Snowbrush Chokecherry-Serviceberry-Rose
Halogeton	Salt Desert Shrub
Leafy Spurge	Idaho Fescue Idaho Fescue-Bluebunch Wheatgrass Idaho Fescue-Slender Wheatgrass Rough Fescue-Bluebunch Wheatgrass Rough Fescue-Idaho Fescue Riparian
Mediterranean Sage	Bluebunch Wheatgrass Bluebunch Wheatgrass-Sandberg Bluegrass Idaho Fescue Idaho Fescue-Bluebunch Wheatgrass Wyoming Big Sagebrush Curlleaf Mountain-Mahogany
Musk Thistle	Idaho Fescue Idaho Fescue-Bluebunch Wheatgrass Idaho Fescue-Slender Wheatgrass Idaho Fescue-Threadleaf Sedge Rough Fescue-Bluebunch Wheatgrass Rough Fescue-Idaho Fescue Riparian
Purple Loosestrife	Riparian
Spotted Knapweed	Bluebunch Wheatgrass Bluebunch Wheatgrass-Sandberg Bluegrass Idaho Fescue Idaho Fescue-Bluebunch Wheatgrass Idaho Fescue-Slender Wheatgrass Rough Fescue-Bluebunch Wheatgrass Rough Fescue-Idaho Fescue Riparian Idaho Fescue-Tufted Hairgrass Tufted Hairgrass-Sedge

Table 2-12. Noxious Weeds in the Project Area (continued).

Noxious Weed	Rangeland Cover Types Most Susceptible to Invasion
Squarrose Knapweed	Crested Wheatgrass
Sulfur Cinquefoil	Bluebunch Wheatgrass Bluebunch Wheatgrass-Sandberg Bluegrass Idaho Fescue Idaho Fescue-Bluebunch Wheatgrass Idaho Fescue-Slender Wheatgrass Idaho Fescue-Threadleaf Sedge Rough Fescue-Bluebunch Wheatgrass Rough Fescue-Idaho Fescue Idaho Fescue-Tufted Hairgrass Tufted Hairgrass-Sedge
Yellow Starthistle	Bluebunch Wheatgrass Bluebunch Wheatgrass-Sandberg Bluegrass Idaho Fescue Idaho Fescue-Bluebunch Wheatgrass Curlleaf Mountain-Mahogany

[1] Society for Range Management cover types listed in Shiflet (1994).

Source: Summarized from Appendix F and Marcot et al. (1996).

material produced by cheatgrass produces a flammable fuel that results in more frequent wildfires compared with fire frequency before the arrival of Europeans. As a result of frequent fire, critical big game winter range and habitat supporting North America's densest concentration of nesting raptors has been reduced, native sensitive plant species are threatened, native plant diversity is reduced at both the local and landscape scale, and recovery periods are extended. Cheatgrass has adapted to the post-fire environment and uses the abundant nutrients and soil water to establish an environment that is less favorable to perennial plants. Cheatgrass has adapted to many communities including low elevation salt desert shrub and higher elevation ponderosa pine. Populations of cheatgrass also differ genetically, which contributes to the evolution of specialized types adapted to different environments. The "cheatgrass-wildfire cycle" presents the greatest risk to the Wyoming big sagebrush portion of the big sagebrush cover type and to the more moist salt desert shrub plant communities within the salt desert shrub cover type. Figure 2-14 illustrates the altered sagebrush steppe cycle.

Cheatgrass has a short growing season, from fall to June the next year, but during that period it can produce more plant material than native vegetation or seeded forage wheatgrass species. However, the variability from year to year associated with production of cheatgrass is greater than native or introduced perennial grasses. The short growing period means that cheatgrass is palatable and nutritious for herbivores for a considerably shorter time than native perennial species on rangeland.

Once established, cheatgrass can inhibit the growth of perennial plants native to the site, thereby perpetuating the cheatgrass fire cycle and causing depletion of volatile nutrients and accelerated soil erosion. Livestock grazing can reduce the amount of cheatgrass on the range and thus the spread of fire, because if cheatgrass is grazed down in the spring, less cheatgrass is available to burn later. However, it is not desirable to allow continuous spring grazing, which may cause a further decrease of native perennial grasses. Once native perennial grasses are lacking to the point of being only remnants on the site,

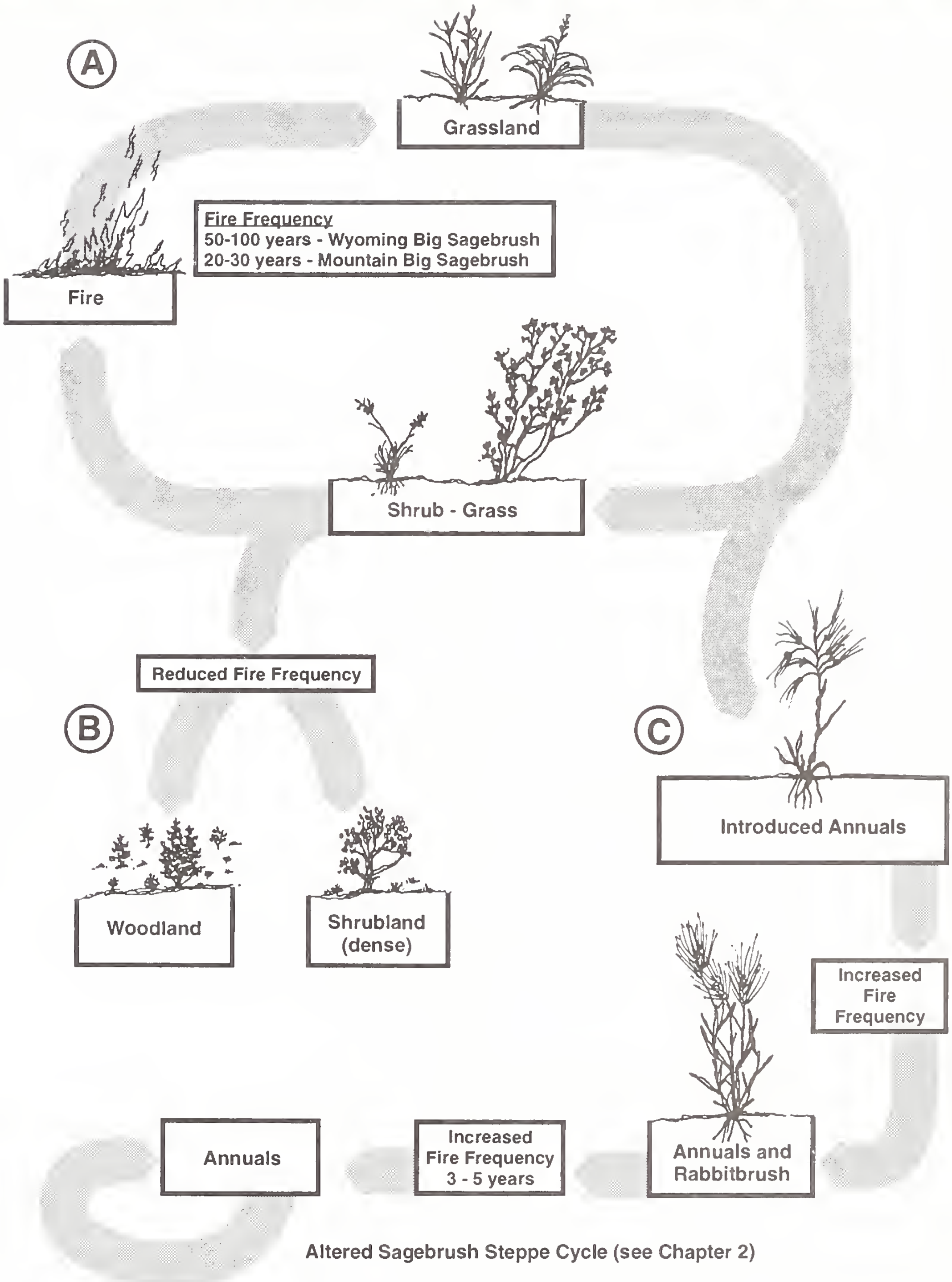


Figure 2-14. Sagebrush Steppe Succession - three common pathways of succession in the sagebrush steppe. Pathway A represents a succession from a grassland to a shrub-grass dominated plant ocmmunity, with fire acting to move the shrub-grass community back to a grassland. Pathway B represents succession of a shrub-grass dominated plant community to either a woodland (dominated mostly by juniper) or a shrubland, caused by a reduction on fire occurrence. Pathway C represents succession of a shrub-grass dominated plant community to a community dominated by introduced annual grasses, characterized by an increase in fire occurrence. Introduced annual grasses have invaded these communities partially as a result of excessive grazing pressure. Once dominated by introduced grasses, the community tends to remain this way because of the frequent fire, which prevents shrubs from establishing. (Adapted from Vavra et al. (editors). 1994. Ecological Implications of Livestock Herbivory in the West).

then methods involving seeding would be the only recourse if the objective is to use perennial plants to reestablish rangeland function.

Cheatgrass continues to expand, including into forests and deserts. Although once established it tends to form a stable state, with frequent fire maintaining the stand, even less desirable weeds such as medusahead and yellowstar thistle are now invading cheatgrass-dominated rangeland and are further degrading site potential. This scenario has been referred to as the "downward spiral" and places even more urgency on controlling or rehabilitating cheatgrass rangeland.

Introduced Forage Grasses

(Primarily taken from Miles and Karl 1995a.)

Environmental and site conditions including climate, geomorphology, soil type, salinity, slope, aspect, seed sources, existing vegetation, and human impacts and management determine the fate of a plant species on a site. Plants are most competitive in environments where they are best adapted, and competitiveness declines as the environment becomes less favorable. At the extreme, even the most "aggressive" of plants do not exist in areas outside their tolerance limits.

Rangeland damage has prompted management decisions to plant introduced forage grasses. In arid regions, hydrology is altered, soils erode, and soil and nutrient processes are impaired when the vegetative cover is removed. In the absence of native species that are adapted to human-altered environments, the planting of introduced forage grasses can help to stabilize soils, provide forage for livestock and wildlife, and preserve ecosystem processes in general.

However, the introduction of forage grasses creates biodiversity concerns. Certain seeded species (such as crested wheatgrass, the intermediate-pubescent wheatgrass complex, Kentucky bluegrass, hard fescue, and orchardgrass) have become established as monocultures in situations where (a) all competing vegetation was removed before seeding and (b) no other well adapted species, such as noxious weeds, are present that potentially would encroach and take over the new seeding. Therefore, if vegetation has been removed by fire, grazing, or cultural practices before seeding of introduced forage grasses, the likelihood is increased that a monoculture will form as a result of the seeding. (In general, there is little likelihood that the introduced forage grasses themselves would encroach into undisturbed areas or replace existing vegetation.) Converting vegetation types from a variety of native species to one or a few selected species has been a strategy to protect watershed function following wildfires, and to provide forage, mainly for livestock. But in most cases, the seeding of the rangelands has initially resulted in less plant and animal diversity than what was there historically. Such changes in diversity and structure can markedly alter the food sources and the thermal and visual cover for wildlife, resulting from a new habitat of more uniform height and spacing. These changes affect the abundance and numbers of wildlife species that were dependent on the vegetation that was there historically.

Within the Montana, Idaho, Washington, and Oregon portions of the project area, about 2.25 million acres of BLM-administered land have been seeded to introduced forage grasses ~ 1.41 million in Idaho and 840,000 in Oregon and Washington east of the Cascades. Crested wheatgrass is the predominant species that was seeded, mostly in the dry shrubland PVG within the Owyhee Uplands and Upper Snake ERUs.

Climate and Disturbance Stresses

(Primarily taken from Leonard and Karl 1995b.)

Climate is a driving variable affecting site susceptibility to stresses on both vegetation and soils and affecting resiliency to recover from stresses. Arid areas that receive less than 12 inches of average annual precipitation (map 2-1, in the Physical Environment/Climate section), in particular, are subject to extremes and/or episodic events that in conjunction with other ecosystem stresses can lead to degradation and inhibit recovery. While the exact status of soil and vegetation indicators must be determined by on-site investigations, there are indicators of relative susceptibility to disturbance stresses. Soil properties that may make certain sites more susceptible to range health stress include erodibility by water or wind, salinity and sodium content, and shrink-swell potential. Vegetation indicators of susceptibility might include composition of flammable exotic or noxious weed species; however, these plant community characteristics are more appropriately analyzed at the mid-scale utilizing inventory data or on-site determinations.

The 10 to 12 inch precipitation zone in the project area appears to be particularly susceptible to

invasion by exotic annuals. (However, this zone is proposed as *moderately* susceptible, rather than *highly* susceptible, because it is at the lower range for reseeding of perennial species, provided that soil factors are not limiting.) An annual precipitation zone less than 10 inches may be somewhat less susceptible to initial invasion by annuals, but once established, the likelihood of recovery by reseeding or other means is exceedingly diminished.

Leonard and Karl (1995b), summarize the frequency of drought and occurrence of favorable years for seedling establishment for climate divisions in the project area. Periodic drought may facilitate woody plant establishment and canopy development or result in high weed biomass, including flammable exotics, in succeeding years of high rainfall. The more arid the area the more frequent is the occurrence of drought years. Seedling establishment of perennial species usually requires two or more favorable years in a row, which occurs infrequently and unpredictably in the project area and in most cases is preceded or succeeded by at least moderate drought conditions. Frequent incidence of drought and few favorable periods of precipitation for plant recruitment can worsen grazing disturbances if not managed properly. Regardless of grazing strategy, continued stocking at near normal levels during moderate to severe drought is probably the greatest cause of range deterioration. Areas that are especially susceptible to range deterioration in the UCRB planning area are dry shrublands in the Owyhee Uplands and Upper Snake ERUs, where thousands of acres of rangeland have been taken over by altered sagebrush steppe. Reduced grazing intensities during drought, and presumably for some time following, are necessary to minimize damage and hasten recovery of perennial vegetation.

Other Factors Influencing Rangeland Health

Western Juniper and other Woody Species Expansion/Density Concerns

(Primarily taken from Karl and Leonard 1995.)

Western juniper is a relatively small- to medium-statured native tree of the Pacific Northwest. Since the late 1800s, western juniper has increased its acreage approximately 3–10 times, with most of the current acreage lying within the Owyhee Uplands ERU. Western juniper also has increased in density.

Climate and fire contributed to the prehistoric expansion and contraction of western juniper's distribution. Settlers initiated fire exclusion policies which probably contributed to the expansion of young juniper woodlands. The loss of fine fuels to carry fire, caused in large part by improper livestock grazing, probably played a larger role in fire frequency reduction than did active suppression. The combined impacts of improper livestock grazing, reduced fire frequency, and possibly climate change probably are responsible for expansion of western juniper woodlands during the past 100 years. The result is a reduction in grasses, forbs, shrubs, and young juniper that provide forage for livestock and protection from soil erosion.

As western juniper woodlands increase in density, understory vegetation production declines. Conversely, after reduction of western juniper density, site productivity of understory species typically increases. However, undesirable species, especially cheatgrass and noxious weeds, increase following juniper removal if they were present before removal.

Healthy western juniper woodlands, with a full complement of understory non-vascular species (for example, species composing microbiotic crusts), grasses, forbs, and shrubs, represent one of the most diverse plant communities in the project area. However, biodiversity is reduced on sites where western juniper has increased in density to the point that understory vegetation is excluded. Therefore, the expansion and increasing density of western juniper withinnative plant communities poses a threat to species that depend on the habitat within those communities.

Western juniper expansion also has affected hydrologic functions. Western juniper intercepts rain and snow with its canopy, which results in less water reaching the soil surface, especially in low intensity storm events. On sites where western juniper has excluded understory vegetation, particularly in spaces between canopies, infiltration has probably declined and runoff and erosion have probably increased, especially under high intensity storm events. The hydrological effects of western juniper increase are difficult to separate from those resulting from improper livestock grazing, but where improper livestock grazing has contributed to the decline in understory vegetation it has probably contributed to increased runoff and erosion.

The reduction of fires, as a result of fire suppression or the reduction of the amount of flammable fuels, has also affected other woody species. Conifers (ponderosa and lodgepole pine and Douglas-fir) have encroached at various rates onto mostly grassland, cool shrubland, and meadow type habitats primarily in the eastern Idaho-Western Montana areas and in the Cascades. Fire exclusion and climate have been considered the main reasons for this encroachment. Sagebrush, mainly Mountain Big Sagebrush within the cool shrublands types, have increased in density in many areas throughout the project area, especially in eastern Idaho and western Montana and the higher elevation areas in western Idaho and eastern Oregon. As with juniper, the more dense these woody species get the more of an effect there is to the understory vegetation. Productivity is normally reduced in the more dense areas, with biodiversity reduced as a result of the understory being out-competed for available nutrients and water by the larger and deeper-rooted woody species. If fire is reintroduced into these dense areas prior to the loss of the native understory vegetation, then productivity and biodiversity can be enhanced. But if undesirable exotic vegetation such as cheatgrass becomes a major component of the understory, then fire may lead to Altered Sagebrush Steppe. In addition, if most of the understory is lost or lacking to the point of not providing a seed source, then the removal of the woody species may expose the soil to accelerated erosion until either native or exotic species get a foothold in the area.

Microbiotic Crusts: Ecology and Implications for Rangeland Management

(Primarily taken from Leonard et al. 1995.)

Microbiotic crusts consist of lichens, mosses, algae, fungi, cyanobacteria, and bacteria growing on or just below the soil surface in a thin layer in open spaces between larger plants. These crusts play a role in nutrient cycling, soil stability and moisture, and interactions with vascular plants. Microphytic plants in the crusts provide forage for invertebrates, and some lichens growing on or at the soil surface (such as non-attached lichens) provide forage for big game species during critical winter periods. Some microphytic plants are also potential environmental indicators. The ecological role of microbiotic crusts is probably most notable on sites that support relatively sparse vegetation cover. These sites are mostly found in the Owyhee Uplands and Upper Snake ERUs. Potential vegetation types in the project area associated with substantial microbiotic crust components include: (1) all plant communities within salt desert shrub, (2) many of the sagebrush types, and (3) the drier juniper types.

Soils stabilized by microbiotic crusts tend to have greater concentrations of organic material, nitrogen, exchangeable manganese, calcium, potassium, magnesium, and available phosphorous. Microbiotic crusts can be the major source of nitrogen in juniper-sagebrush woodlands that apparently contain no other nitrogen-fixing organisms. However, in a natural setting, questions remain about the availability to vascular plants of nitrogen fixed by microbiotic crusts.

Microbiotic crusts can comprise 70 to 80 percent of the ground cover in some areas. They can contribute to soil structure, and thus soil stability, by binding soil particles within the physical structures of the microphytes, and by trapping soil particles.

The influence of microbiotic crusts on infiltration and soil moisture has been noted as positive, negative, or neutral, and this is not conclusive. This is because many factors have a bearing on infiltration and soil moisture, including: soil type, degree of microbiotic crust development and types of organisms in the crust, climate, disturbance history, and state of wetness of a given soil type when it is rewetted. Generally, however, the presence of microbiotic crusts will improve infiltration. The fact that microbiotic crusts will develop quite well on soil types characterized by clay and fine silt with an inherently low capacity for soil water infiltration confuses the picture and makes it more difficult to truly depict the crust's role in infiltration.

Soil surface-disturbing activities ~ for example, grazing, off-road recreational and military vehicle use, and recreational hiking ~ reduce the maximum potential development of microbiotic crusts. Fire also depletes microbiotic crusts, at least temporarily. Except where habitat is completely displaced such as in urbanization or dominance by exotic annuals, recovery of microbiotic crusts ranges from a few years to 100 years after removal of the activity. Following fire, algal components of the crust can recover substantially within 5 to 10 years, whereas lichens and mosses take 10 to 20 years or more. Average return frequencies of natural fire of 50

years in the shrub steppe, to as high as 100 years in the more arid Snake River Plain, are adequate to restore advanced development of crust components. Current fire intervals of less than five years can occur on the annual grasslands (altered sagebrush steppe) of the Snake River Plain, because the cover of exotic annuals, for example cheatgrass and medusahead, and their associated litter, perpetuates the fire cycle. This results in substantial risk to microbiotic crust. Management practices that reducc fire size and frequency would enhance microbiotic crust development.

Desired levels of microbiotic crusts should be based on site capability and rangeland health indicators of site stability and nutrient cycling. Additional research is needed to establish realistic microbiotic crust objectives in most potential vegetation types. Grazing strategies that incorporate rest or deferment during optimal growing conditions for crust organisms (spring-early summer) and that minimize surface disturbances when microbiotic crusts are most vulnerable (dry season), may help to enhance microbiotic crust cover.

Microbiotic crusts are generally lacking in the sagebrush and salt desert shrub potential vegetation types in the project area, especially on altered sagebrush steppe in the Owyhee Uplands and Upper Snake ERUs. Inappropriately high livestock grazing pressure during the dry seasons is believed to be responsible to a large degree.

The role of microbiotic crusts in the project area is not conclusive at this time. Most of the studies of microbiotic crusts have been conducted in the southern Great Basin and Colorado Plateau. Strict extrapolations of findings from these studies to the project area, and prescriptive management direction, at this time would be premature until more definitive studies of microbiotic crusts are conducted in the project area. For these reasons, microbiotic crusts are discussed in the Guidelines appendix to Chapter 3 but not in the objectives and standards section.

Livestock ~ Big Game Interactions

(Primarily taken from Miles and Karl 1995b.)

Concerns over livestock use of big game ranges and vice-versa have been debated between rangeland professionals and wildlife biologists for years. When mismanaged, either big game (for this discussion, referring to elk, mule deer, pronghorn antelope, and bighorn sheep) or livestock can have substantial effects on the other, especially during critical times of the year on rangeland in poor condition. An understanding of livestock and big game habitat, diet, dietary overlap, and impacts on vegetation is necessary to minimize conflicts between livestock and big game.

Dietary and habitat overlap does not necessarily mean that serious (population reduction) competition is occurring. Patterns of use, time of use, condition of the range, health of the wildlife population, weather, and closeness to water affect the seriousness of the situation. Competition between livestock and big game is increased where winter ranges are in degraded condition that limits the type, quality, and quantity of forage available for both livestock and big game.

Elk and cattle competition has the potential to be highest on foothill rangelands used by cattle in the fall and by elk in the winter. However, cattle prefer the bottoms and lower slopes whereas elk prefer the upper slopes and steeper terrain. Elk foraging habitats may sometimes be influenced by cattle presence or use, and stocking rates and types of grazing systems may substantially alter elk foraging habits. Elk and sheep competition has the potential to be highest on winter range used by both species. Summer range use by both species also has potential for competition because of high forb use by both species, although elk may use different species of forbs in their diet than do sheep. Deer and cattle have the greatest potential for competition in the winter and spring. Competition is especially high on winter ranges lacking in browse, or on those winter ranges that are in degraded condition and lack grass cover.

Bighorn sheep and cattle have the highest potential for competition where cattle make substantial use during fall and winter of bighorn winter range. Detailed information is lacking on domestic sheep and bighorn sheep social tolerance and forage competition. The negative effects of disease transmission between the two species probably overshadows potential negative effects from forage competition. The largest impediment to restoring bighorn sheep is the potential for disease transmission from domestic sheep that graze near or within historical and occupied bighorn sheep ranges.

Pronghorn antelope and cattle have the greatest potential for competition on degraded rangelands

where browse is the main forage and grasses are lacking. Otherwise a dietary overlap seldom exceeding 25 percent precludes serious competition between these two ungulates.

Stocking rate and type of grazing system affect the quantity and quality of key forage species in the project area. Light stocking rates increase production of some grasses and browse species, especially in riparian and forest habitats, compared to heavier stocking rates. Heavy, long-term stocking rates decrease the amount of key forage plants and increase the amount of less desirable plants. Heavy livestock use of grasses increases shrub cover. Heavy livestock use of browse, such as aspen, bitterbrush, and willows, decreases the competition with grasses.

Big game overbrowsing of shrub and tree species in riparian zones alters the plant composition or in some cases eliminates the shrub or tree species. In general, big game have had negative effects on riparian areas on both winter and summer ranges. Big game negatively affect stands of native grasses where heavy winter and spring use occurs because of high population levels.

Specific locations where livestock/big game conflicts are a serious concern in the project area have not been identified in the Scientific Assessment. Generally, these conflicts occur throughout the UCRB planning area where limited habitat is available for wildlife. The potential for conflicts can be high, especially during severe winters on limited winter range, where large populations of big game exist, such as in eastern Idaho, in the Upper Snake and Snake Headwaters ERUs. In addition, increasing big game populations, such as elk and pronghorn, have caused conflicts with farming interests since big game have had impacts on crops during drought years. Serious conflicts occur when winter ranges are degraded to conditions where biodiversity is lacking, such as in areas of altered sagebrush steppe, and when winter conditions become severe. Serious conflicts between livestock and big game can be prevented by managing habitat, especially winter range, so that vegetation health and diversity are maintained, and by providing forage diversity so that many species are available for both wildlife and livestock forage use.

Summary of Changes from Historical to Current by Ecological Reporting Unit, by Potential Vegetation Type (PVG), and by Terrestrial Community for BLM/Forest Service-Administered Lands.

ERU 6 ~ Blue Mountains

Dry Grass PVG.

◆ An extensive invasion of exotic species.

Dry Shrub PVG.

◆ A 40 percent increase in upland shrub.

ERU 9 ~ Upper Clark Fork

Cool Shrub PVG.

◆ A 70 percent decrease in upland shrub.

ERU 10 ~ Owyhee Uplands

Dry Shrub PVG.

◆ An extensive invasion of exotic species.

ERU 11 ~ Upper Snake

Cool Shrub PVG.

◆ A 35 percent increase in upland shrub.

Dry Shrub PVG.

◆ A 25 percent decrease in upland shrub.

◆ An extensive invasion of exotic species.

ERU 12 ~ Snake Headwaters

Cool Shrub PVG.

◆ A 70 percent decrease in upland shrub.

Dry Shrub PVG.

◆ A 90 percent decrease in upland shrub.

ERU 13 ~ Central Idaho Mountains

Cool Shrub PVG.

◆ An extensive invasion of exotic species.

Dry Shrub PVG.

◆ An extensive invasion of exotic species.

Source: ICBEMP report ah43e_uc.rtf

Aquatic Ecosystems

Key Terms Used in this Section

Anadromous fish ~ Fish that hatch in fresh water, migrate to the ocean, mature there, and return to fresh water to reproduce; for example, salmon and steelhead.

Beneficial Uses ~ Any of the various uses which may be made of water including, but not limited to, domestic water supplies, industrial water supplies, agricultural water supplies, navigation, recreation in and on the water, wildlife habitat, and aesthetics. The beneficial use is dependent upon actual use, the ability of the water to support a non-existing use either now or in the future, and its likelihood of being used in a given manner. The use of water for the purpose of wastewater dilution or as a receiving water for a waste treatment facility effluent is not a beneficial use.

Best Management Practices ~ Practices designed to prevent or reduce water pollution.

Coarse woody debris (CWD) ~ Pieces of woody material having a diameter of at least three inches and a length greater than three feet (also referred to as large woody debris, or LWD).

Endemic ~ Plants or animals that occur naturally in a certain region and whose distribution is relatively limited to a particular locality.

Extinction ~ Complete disappearance of a species from the earth.

Extirpation ~ Localized disappearance of a species from an area.

Headwaters ~ Beginning of a watershed; unbranched tributaries of a stream.

Hybridization ~ The cross-breeding of unlike individuals to produce hybrids.

Hydrologic ~ Refers to the properties, distribution, and effects of water. "Hydrology" refers to the broad science of the waters of the earth—their occurrence, circulation, distribution, chemical and physical properties, and their reaction with the environment.

Pools ~ Portions of a stream where the current is slow, often with deeper water than surrounding areas and with a smooth surface texture. Often occur above and below riffles and generally are formed around stream bends or obstructions such as logs, root wads, or boulders. Pools provide important feeding and resting areas for fish.

Resident ~ Fish that spend their entire life in freshwater; examples in the UCRB include bull trout and westslope cutthroat trout.

Riparian areas ~ Area with distinctive soil and vegetation between a stream or other body of water and the adjacent upland; includes wetlands and those portions of floodplains and valley bottoms that support riparian vegetation.

Salmonid ~ Fishes of the family Salmonidae, including salmon, trout, chars, whitefish, ciscoes, and grayling.

Sediment ~ Solid materials, both mineral and organic, in suspension or transported by water, gravity, ice, or air; may be moved and deposited away from their original position and eventually will settle to the bottom.

Sensitive species ~ Species identified by a Forest Service regional forester or BLM state director for which population viability is a concern either (a) because of significant current or predicted downward trends in population numbers or density, or (b) because of significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

Strongholds/Strong populations (fish) ~ Watersheds that have the following characteristics: (1) presence of all major life-history forms (for example, resident, fluvial, and adfluvial) that historically occurred within the watershed; (2) numbers are stable or increasing, and the local population is likely to be at half or more of its historical size or density; (3) the population or metapopulation within the watershed, or within a larger region of which the watershed is a part, probably contains at least 5,000 individuals or 500 adults.

Uplands ~ The portion of the landscape above the valley floor or stream.

Watershed ~ 1) The region draining into a river, river system, or body of water. 2) In this EIS, a watershed also refers to a drainage area of approximately 50,000 to 100,000 acres, which is equivalent to a 5th-field Hydrologic Unit Code (HUC).

Wetlands ~ In general, an area soaked by surface or groundwater frequently enough to support vegetation that requires saturated soil conditions for growth and reproduction; generally includes swamps, marshes, bogs, wet meadows, mudflats, natural ponds, and other similar areas. For legal definition, see Glossary in Chapter 5.

Introduction to Aquatic Ecosystems

This section summarizes the condition of aquatic ecosystems in the project area by first describing the hydrologic environments of watersheds, water bodies, riparian areas, and wetlands. Then the status of fish species that use and are affected by these environments are described. Information is drawn from the Landscape Ecology and Aquatic Staff Area Reports (1996), Henjum et al. (1994), Wissmar et al. (1994), and other sources as cited. Within the sections describing hydrologic environments, there are descriptions of key processes and conditions that act to form and modify the physical and vegetational characteristics of aquatic ecosystems, such as streamflow, sedimentation, erosion, channel formation, and riparian vegetation. Those processes and conditions that can be affected by regional-scale management decisions are emphasized. A summary of current conditions in each of these hydrologic environments is also included.

The section describing fish focuses on past and current conditions of many fish species in the entire project area. Special attention is given to native fish species, especially wide-ranging salmon and trout species. Similar to the descriptions of the hydrologic environments, aspects of native fishes that are particularly affected by regional-scale management decisions are emphasized. Issues discussed include: (1) the overall status of native fish species in the region; (2) management of habitat for rare and endangered species, especially wide-ranging species; (3) genetic diversity; and (4) introduction of non-native species.

Hydrology and Watershed Processes

Summary of Conditions and Trends

- Management activities throughout watersheds in the project area have affected the quantity and quality of water, processes of sedimentation and erosion, and the production and distribution of organic material, thus affecting hydrologic conditions. On federally administered lands the most pronounced changes to watersheds are due to road construction, vegetation alteration (including silvicultural practices, fire exclusion, and forage production), and improper livestock grazing.
- Environmental changes within landscapes commonly cumulate and appear on a watershed basis.

Watersheds are natural divisions of the landscape and the basic functioning unit of hydrologic systems. Watersheds can be considered in a variety of scales ranging from continents to hillslopes (see figure 2-15, Ecosystem Scales). Watersheds are hierarchical ~ smaller ones nest within larger ones. Commonly used terms referring to watershed scale are shown in table 2-13 (see also figure 2-2, Hydrologic Hierarchy, in the Introduction to this chapter). Landforms contained within watersheds are also hierarchical. Valleys nest within watersheds, and their form is in part controlled by watershed physiography and geologic history. Streams and rivers flow through valleys, and channel form is influenced by interactions between streams and valleys. Individual features within channels, such as pools and riffles, reflect stream-channel processes and history, and as a result, are the culmination of watershed processes at multiple scales. These principles of multi-scaled analysis were used in the Scientific Assessment (Quigley and Arbelbide 1996) to evaluate the condition and inherent sensitivity of watersheds in the ICBEMP project area.

These natural hierarchies make watersheds an appropriate context for considering many ecological processes. Physical processes such as rainfall, streamflow, erosion, and sedimentation interact within watershed boundaries to shape and form the landscape. Watershed boundaries have meaning for living organisms as well. Most aquatic species, such as fish, do not cross watershed divides. Other species, particularly riparian area species such as the beaver, can be considered watershed residents. Human residence and use patterns are also strongly tied to locations of lakes, rivers, and streams.

Environmental changes commonly cumulate and appear on a watershed basis. Changes in soil, vegetation, topography, and chemicals result in changes in the quantity and quality of water, sediment, and organic material that flow through a watershed. The response of a particular watershed to environmental change varies considerably because each watershed is unique. Factors that govern how a watershed may respond to environmental change include the size and location of these changes, the physical and biological characteristics of the watershed, and the history of natural and human disturbances.

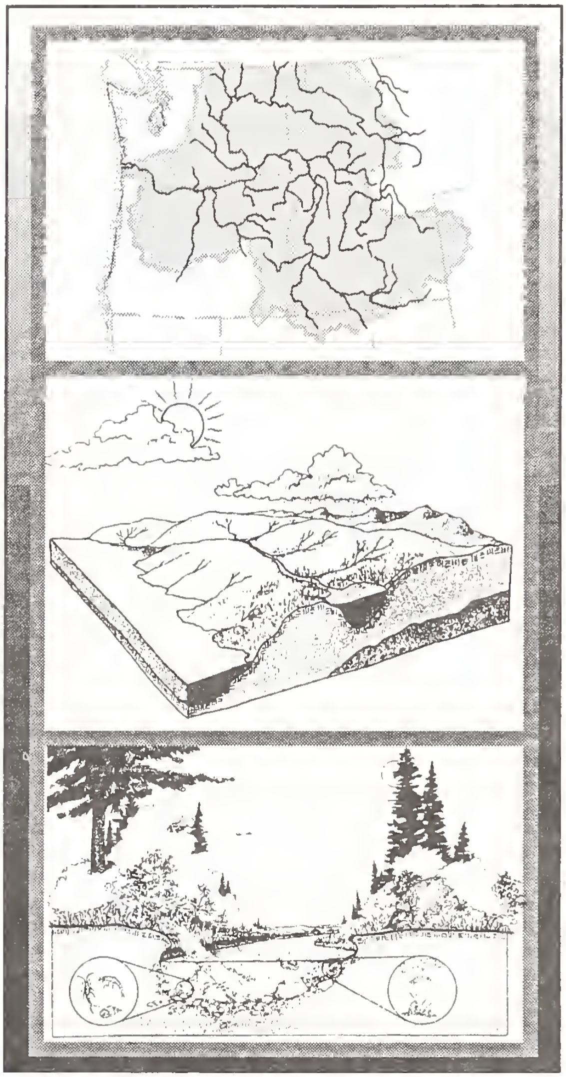


Figure 2-15. Ecosystem Scales.

Watersheds and ecosystems can be considered on a variety of scales ranging from continents to hillslopes. The ICBEMP project focuses its attention on the broader scales illustrated in the top two boxes.

Streams, Rivers, and Lakes

Summary of Conditions and Trends

- Flow regimes of streams, rivers, and lakes throughout the UCRB planning area have been extensively altered by dams, diversions, and control of lake outlets. Banks and beds of streams, rivers, and lakes have been altered by bank and shore structures, including urban development, transportation improvements, instream mining activities, flood-control works, and alteration of riparian areas. In general, the changes have been greatest for the larger streams, rivers, and lakes.
- Water quantity and flow rates have been locally affected by dams, diversions, and groundwater withdrawal. More subtle but widespread changes in water quantity and flow patterns on federally administered lands have probably been caused by road construction and changes in vegetation due to silvicultural practices and improper livestock grazing.
- Within the UCRB planning area, some Forest Service- or BLM-administered streams are Water Quality Limited as defined by the Clean Water Act. On Forest Service-administered lands in the project area, the primary water quality problems are sedimentation, turbidity, flow alteration, and high temperatures. On BLM-administered lands, high sediment, turbidity levels, and temperatures are the primary reasons for listing as Water Quality Limited.
- Streams and rivers are highly variable across the project area, reflecting diverse physical settings and disturbance histories. Nevertheless, important aspects of fish habitat, such as pool frequency and large woody debris abundance, have decreased

throughout much of the project area. Pool frequency and wood frequency are generally less in areas with higher road densities and in areas where timber harvest has been a management emphasis.

Movement of water is one of the fundamental ways to transfer energy and materials in ecosystems (figure 2-16). Water in streams and rivers transports sediment, organic material, nutrients, and aquatic organisms, resulting in constant redistribution and shaping of landforms and stream channels. The wide variety of water bodies, with their associated energy and food sources, provide abundant and diverse habitats for water-dependent plant and animal species.

Streams, rivers, and lakes are also a focus for human activities. As human population in the planning area increases, and as demands for food, energy, transportation networks, and recreation opportunities expand, uses of stream and river systems increase. These uses have resulted and will result in escalating conflicts over water and stream channels, both between competing human uses, and between human uses and ecological requirements of the native biota. Resolution of many of these conflicts is outside the authority of BLM and Forest Service decision-makers, and is therefore outside the scope of this EIS. However, there are some critical regional issues regarding streams and stream channels that are affected by BLM and Forest Service decision-making. These issues have to do with water quantity and quality, habitat quality, and stream channel processes.

Water Quantity and Quality

Water quantity and quality are important components of aquatic habitats. Moreover, the primary influence land managers have over the condition of aquatic ecosystems on Forest Service- or BLM-administered lands is through management of water quantity and quality.

Water Quantity

Within the upper Columbia Basin, there are approximately 133,100 miles of streams and rivers (including larger irrigation canals) and several thousand lakes mapped at the scale of 1:100,000. Thirty percent of these streams and a majority of the lakes are on Forest Service- or BLM-administered lands. Most of these streams ultimately drain into the Columbia River, which has a drainage area of 237,000 square miles (152 million acres) and an average annual discharge of 140 million acre feet at the town of The Dalles, Oregon. About 35 percent of the flow at The Dalles originates from Canada. A large part of the flow from the southeastern portion of the project area enters the Columbia River via the Snake River, which has a drainage area of 108,500 square miles (69 million acres) and an average annual discharge of 40 million acre feet near its confluence with the Columbia River in south-central Washington.

Table 2-13. Hierarchy of Watersheds, UCRB

Hierarchy Term	Hydrologic Unit code (HUC)[1]	UCRB Example	Approximate Size of Example, in Acres
Region	First Field	Columbia River	165,760,000[2]
Subregion	Second Field	Lower Snake River	22,400,000
River Basin	Third Field	Salmon River	8,960,000
Subbasin	Fourth Field	South Fork Salmon River	840,000
Watershed	"Fifth Field"	East Fork South Fork Salmon River	84,500
Subwatershed	"Sixth Field"	Profile Creek	12,600

[1] First Field through Fourth Field HUCs were formally designated by the U.S. Geological Survey. "Fifth Field" and "Sixth Field" watersheds were designated for the project area as a part of the landscape Staff Area Report (1996).

[2] The area of the Columbia River watershed includes the entire basin, including portions outside the project area west of the crest of the Cascade Range and in Canada.

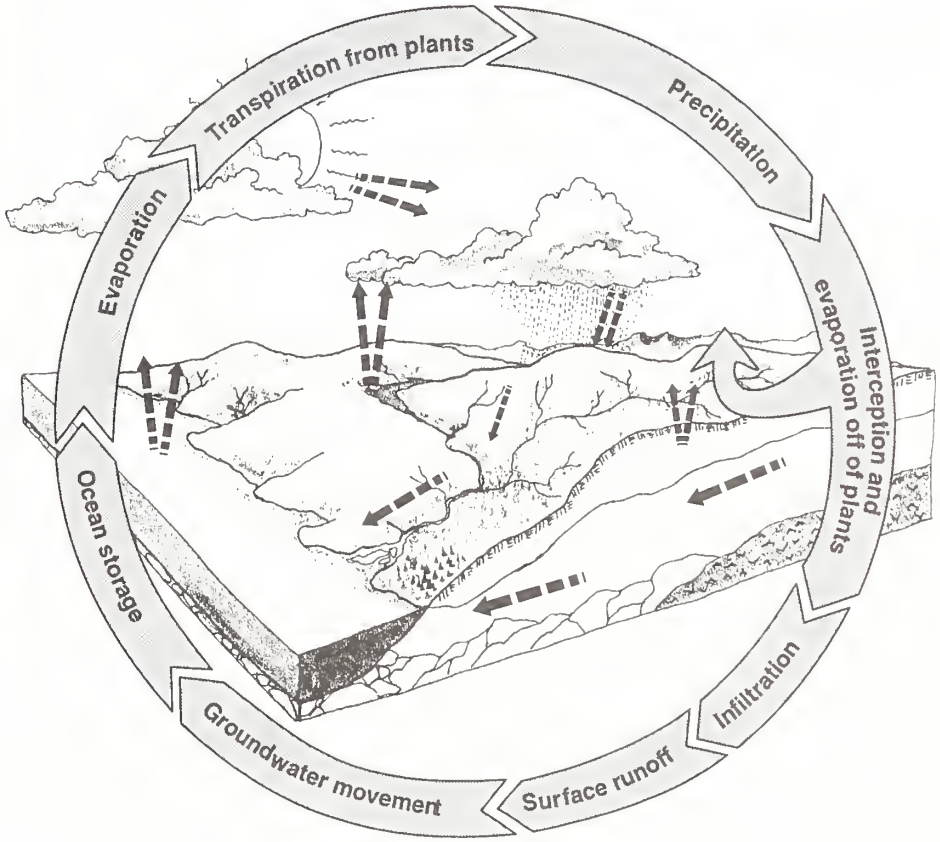


Figure 2-16. The Hydrologic Cycle and Aquatic Ecosystem Health.

A complex system called the hydrologic cycle links atmospheric water, surface water, and groundwater, and controls the distribution and movement of water in every ecosystem. Changes in aquatic and riparian ecosystems in the UCRB planning area pose serious risks to a number of key links in the hydrologic cycle. Among the more observable changes, disturbance and compaction of soil and changes in vegetation are altering the relationships between infiltration, soil moisture storage, groundwater recharge, evapotranspiration, surface runoff, and streamflows.

These alterations can lower water tables, interrupt the return of water to the atmosphere, and affect water quantity and quality in lakes and streams. The interactions of the hydrologic cycle provide the key to processes (such as flooding) that route and deliver water, wood, and sediment to streams and connect the streams to their floodplains, adjacent riparian areas, and uplands. Changes to these interactions and processes are tied inextricably to degradation of aquatic and riparian habitats for anadromous and inland fishes and terrestrial and aquatic wildlife.

The hydrologic and other biophysical and nutrient cycles are key ecological processes in every ecosystem type and are inextricably woven together through and across ecosystem boundaries. The hydrologic cycle is discussed here to highlight its relationship to riparian and aquatic ecosystem health, but it also is critical in rangeland and forest ecosystems.

Photo 15. More than 100,000 miles of streams and rivers of all sizes are found in the upper Columbia Basin. Photo by Doug Basford

Most surface runoff results from snowmelt and/or rainfall in mountainous regions, resulting in spring and summer annual peak discharges. The vast majority of streamflow originates on public lands, especially higher elevation Forest Service-administered lands. There is substantial year-to-year variability in streamflow quantity, because of variability in rainfall and snowfall accumulation (McIntosh et al. 1994).

Most streamflow in the upper basin results from surface runoff or shallow groundwater flow into streams. Groundwater-influenced streams provide unique terrestrial and aquatic habitats because of their relatively constant flows of cold, clear, and high-quality water.

Scarcity of streamflow during the growing season, year-to-year streamflow variability, and the general aridity of low-elevation valleys and plains have spurred flow regulation and storage, water diversions, and groundwater withdrawal throughout the planning area. These human modifications range from massive Federal storage and irrigation projects, to numerous small headwater reservoirs (stock tanks) used for livestock grazing. These projects help assure reliable water supplies for irrigation, livestock, and human use in addition to providing flood control and hydropower benefits. Reservoirs associated with these projects are extensively used for a variety of recreation activities. In total, about seven million acres in the Columbia River Basin are presently irrigated, resulting in a seven to ten percent reduction of annual flow volume (Landscape Ecology STAR 1996). As a result of impoundments and diversions, most streams in the planning area, especially larger ones, have significantly altered flow regimes resulting in changed habitat conditions, especially for those aquatic species that have survival strategies adapted to natural flow patterns. Altered flow regimes also affect channel stability by changing the rates and timing of sediment and organic-material transport.

On Forest Service- or BLM-administered lands, management activities that have altered flow include flow impoundment (dams and reservoirs), water withdrawal (diversions and pumping), road construction, and vegetation manipulation. Timber harvest, fire suppression, improper livestock grazing, and associated activities have altered the timing and volume of streamflow by changing on-site hydrologic processes (Keppeler and Ziemer 1990; Wright et al. 1990). Changes can be either short- or long-term depending on which hydrologic processes are altered and the intensity of alteration (Harr 1983).

Vegetation manipulation activities can change rates and amounts of evaporation and transpiration (water use by plants), and, in some areas, can change rates and volumes of snow accumulation and snowmelt. These effects are best understood for forested environments, where, within clearcuts, snow tends to accumulate in greater amounts and melt faster than in forested areas, leading to larger and earlier peak flows (Harr 1986, King 1994). These effects are greatest in association with rain-on-snow events, during which rain falls on snowpack, causing melting and changes in the timing of runoff. This happens particularly within the "transient snow zone"

found at elevations commonly between 2,000 and 5,000 feet in the UCRB. Although there is less clearcutting now, the hydrologic effects of past clearcuts can persist for three to four decades, depending on vegetation characteristics (FEMAT 1993). Soil compaction due to improper livestock grazing (Platts 1991), and timber harvesting activities, such as yarding and heavy equipment operation, can also result in decreased soil permeability and increased runoff (Chamberlin et al. 1991).

The past history of fire suppression may have also affected flow quantity and quality. On rangelands, fire suppression is partly responsible for expansion of western juniper (Terrestrial STAR 1996). Expansion of western juniper and increasing density can result in decreased understory vegetation, which is believed to contribute to decreased soil infiltration and increased peak discharges during intense rainfall (Terrestrial STAR 1996). In forested environments, increased above-ground vegetation due to fire suppression may also have resulted in increased evapotranspiration rates and decreased runoff. Where high intensity fires have increased due to fire suppression, decreased soil porosity has resulted, thus increasing runoff and soil erosion (McNabb and Swanson 1990). Fire can also cause water-repellent layers to form in soils, resulting in temporarily increased runoff (DeBano et al. 1976).

Road construction in forested environments is a management activity that has probably had a major effect on runoff and streamflow, although most studies investigating this issue have been outside the project area. The relatively impermeable surfaces of roads, associated cutbanks, and roadside ditches result in decreased infiltration and more surface runoff. Roadcuts also intercept subsurface flow and route it quickly to stream channels. Roadside ditches and newly formed gullies downstream from culverts extend the channel network (Harr et al. 1975, 1979; Megahan et al. 1992; Jones and Grant, 1996; Wemple 1993; Ziemer 1981).

Water Quality

As specified in the Clean Water Act of 1972 and subsequent amendments, water quality includes all attributes that affect existing and designated uses of a water body. Included are human uses such as recreation, hydropower, and water supply, and other uses such as maintenance of fisheries and riparian habitats. As a result, water quality attributes that are considered under the Clean Water Act include traditional physical and chemical constituents such as pH, bacteria concentration, temperature, discharge, and factors relevant to aquatic habitat such as the abundance of large woody debris, pool frequency, and riparian canopy density.

The Clean Water Act requires that every two years each State review all available information on water quality as part of a Statewide water quality assessment. Where application of current Best Management Practices or technology-based controls are not sufficient to achieve designated water quality standards, the water body is classified as "Water Quality Limited." About 10 percent of project area streams and rivers are potentially Water Quality Limited. On Forest Service-administered lands in the project area, the primary water quality concerns are sedimentation and turbidity, flow alteration, and high summer water temperatures. On BLM-administered lands, high sediment and turbidity levels and high temperatures are the primary reasons for listing as Water Quality Limited.

Water temperature is considered under the Clean Water Act and is a regionally important facet of aquatic habitat on Forest Service- and BLM-administered lands within the project area. The relationship between land-use practices, water temperature, and effects on fish species is better understood than for any other aspect of water quality (Rhodes et al. 1994). Water temperature influences metabolism, behavior, and mortality of aquatic species (Beschta et al. 1987; Bjornn and Reiser 1991). Salmonids (salmon and trout) are cold-water fish that are particularly sensitive to increases in temperature; sustained water temperatures of greater than 64 to 80 degrees Fahrenheit are lethal for most species. In the upper basin, where summer air temperatures are generally much higher than 80 degrees Fahrenheit, many streams have lost their capability to support cold-water fish, and salmonid mortality in streams that still support salmonids is common due to elevated water temperatures (Henjum et al. 1994).

On public lands in the upper basin, non-point sources of pollution are the primary cause of degraded water quality. A non-point source of pollution is water pollution whose source(s) cannot be pinpointed, but that can be best controlled by proper soil, water, and land management practices.

Water Quality and the Clean Water Act

Water quality is regulated by State environmental agencies under authority granted by the Clean Water Act (1972) and subsequent amendments. Under the Clean Water Act, Federal agencies are, in general, required to meet State requirements. In the upper Columbia Basin, the Forest Service and BLM are the responsible management agencies for water quality on lands they manage, as described in memoranda of understanding (MOUs) with State environmental agencies. These MOUs require Federal agencies to meet water quality standards, monitor activities to assure they meet standards, report results to the States, and meet periodically to recertify Best Management Practices (BMPs) which are practices designed to prevent or reduce water pollution. The primary mechanisms for regulating and controlling non-point sources of pollution are adopting and implementing (1) Best Management Practices, (2) numeric and narrative water quality standards, and (3) the antidegradation policy (40 CFR 131).

Stream Channels

Water, sediment, solutes, and organic material derived from hillslopes and their vegetative cover flow into and through streams and rivers. The shape and character of stream channels constantly and sensitively adjust to the flow of these materials by adopting distinctive patterns such as pools-and-riffles, meanders, and braids (Leopold et al. 1964). The vast array of physical channel characteristics combined with energy and material flow, provide diverse habitats for a wide variety of aquatic and riparian-dependent species.

Stream Channel Processes, Functions, and Patterns

The varied topography within the planning area, coupled with the irregular occurrence of channel-affecting processes and disturbance events such as fire, debris flows, landslides, volcanic activity, drought, and extreme floods, result in a mosaic of river and stream conditions that are dynamic in space and time under natural conditions (Reeves et al. 1995). The primary consequence of most of these disturbances is to directly or indirectly provide large pulses of sediment and wood into stream systems. As a result, most streams and rivers in the planning area probably undergo cycles of channel change on timescales ranging from years to hundreds-of-years in response to episodic inputs of wood and sediment. The types of disturbance, such as fire, flood, or debris flow, that affect the morphology of a particular channel depends on watershed characteristics, channel size, and position of the channel within the watershed (Reeves et al. 1995; Grant and Swanson 1995). Many aquatic and riparian plant and animal species have evolved in concert with the dynamic nature of stream channels, developing traits, life-history adaptations, and propagation strategies that allow persistence and success within landscapes that experience harsh disturbance regimes. Figure 2-17 illustrates how salmon and trout use various portions of a stream during different parts of their life cycles.

Photo 15A: Channels are affected by disturbances such as debris flows, which are dynamic in space and time. Photo by USFS/ Boise NF

In order to guide understanding and management of streams and rivers, stream classification systems (for example Rosgen 1994; Montgomery and Buffington 1994) have been established on the basis of distinctive patterns of stream behavior. These classifications are primarily derived from consideration of stream slope and confinement (relating to the stream's ability to move and erode its banks and bed). In general, stream types range from steep and confined channels that generally consist of step-pool and cascade-dominated streams (Rosgen "type A"; Montgomery and Buffington "source"), through moderate gradient and moderately confined rapid-dominated channels (Rosgen "type B"; Montgomery and Buffington "transport"), to low gradient, unconfined, pool-and-riffle dominated channels (Rosgen "types C, D, and E"; Montgomery and Buffington "response"). Other stream types include:

(1) Gullied, or streams actively eroding their streambeds and streambanks (Rosgen type G) and,

(2) Low gradient, entrenched, wide streams (Rosgen type F).

In general, steeper channels (slopes greater than four percent) are commonly found in the headwater or mountainous portions of a landscape, and are less sensitive to watershed disturbances because of their high degree of confinement and their position high in the watershed unless the soils are highly erosive. Once disturbed, however, steep and confined streams may take considerable time to recover to their previous condition. Channels with slopes between two and four percent generally contain abundant rapids and steep riffles. Lower-gradient streams (slopes less than two

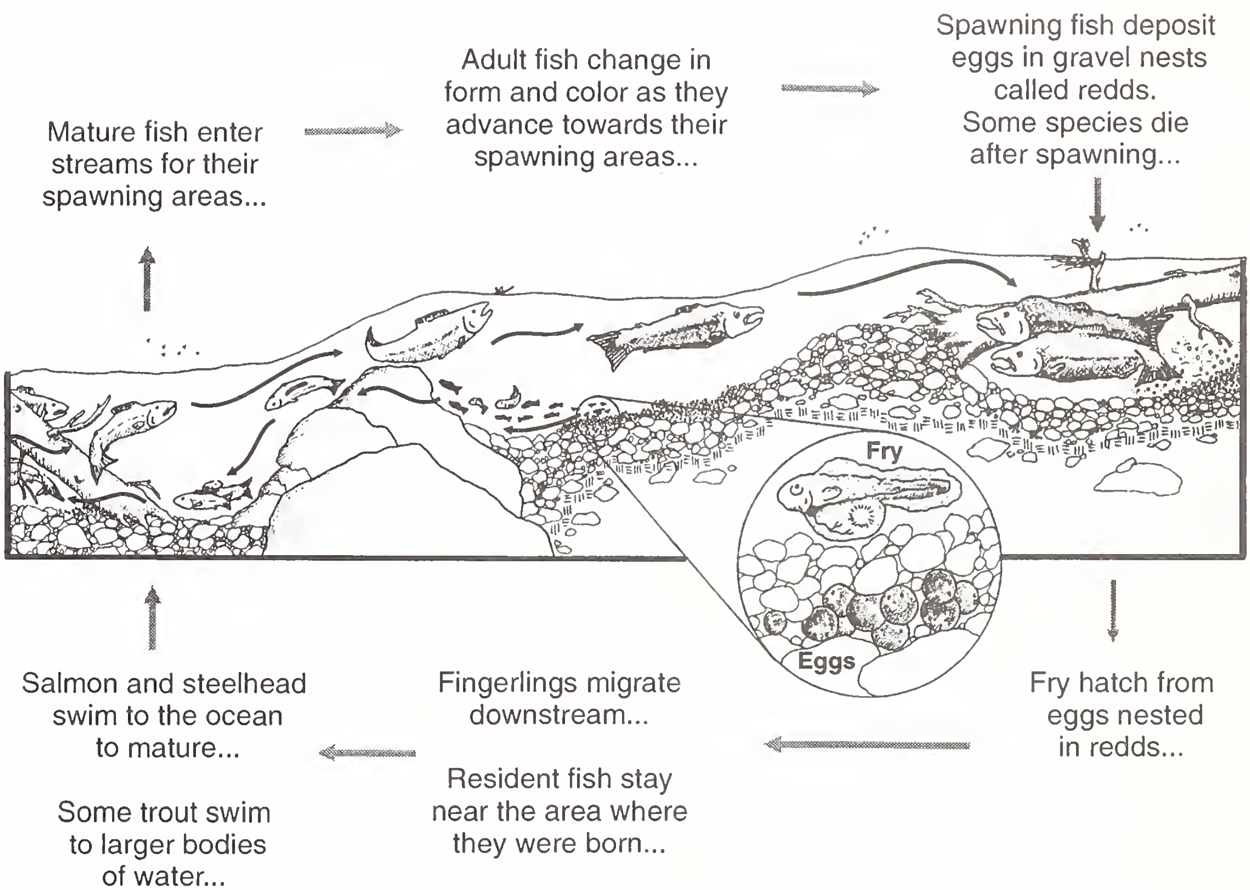


Figure 2-17. Salmon and trout are among the aquatic species whose life cycles have evolved in concert with the dynamic nature of stream channels.

percent) are generally larger, and under natural conditions meander and migrate freely within wider valleys. Low gradient streams and rivers commonly have numerous side channels and high water channels, and generally contain the most biologically productive aquatic ecosystems. These low-gradient channels are generally sensitive to cumulative and local watershed disturbances, but commonly recover quickly where there are natural hydrologic and sediment regimes. Describing watersheds using valleybottom and streamtype settings (see sidebar) provides a broad characterization that integrates the landform and stream features of the valley morphology with the stream channel pattern, shape, and morphology. Streams, on the other hand, can be characterized based on their interrelationship to the valley and adjacent landform. Figures 2-18 and 2-19 illustrate the differences in streamtypes in steep mountainous areas and in lower elevation areas.

Current Conditions

Within the ICBEMP project area, humans have extensively altered stream channels by direct modifications such as channelization, wood removal, diversion, and dam-building, and also by indirectly affecting the incidence, frequency, and magnitude of disturbance events. This has affected inputs and outputs of sediment, water, and wood. These factors have combined to cause pervasive changes in channel conditions throughout the planning area, resulting in aquatic and riparian habitat conditions much different from those that existed prior to extensive human alteration (Henjum et al. 1994; McIntosh et al. 1994; Wissmar et al. 1994). In general, the largest rivers such as the Columbia and Snake rivers, have been converted from free flowing streams to a series of reservoirs. Many intermediate-sized rivers, such as the Payette, Clarks Fork, and Clearwater Rivers, are now important transportation corridors that are flanked by roads, railroads, or both, with floodplains that have been encroached upon by transportation features and other human structures.

Indirect effects of past land management activities are also pervasive in the planning area. Mining, timber harvest, grazing, beaver trapping, and road-building have all altered channels by affecting the rate with which sediment, water, and wood enter and are transported through stream channels. Almost all Forest Service- or BLM-administered lands that are outside designated Wilderness have been entered at some level for resource extraction since the early 1800s. Most of the large-scale and intense operations, such as in-stream dredging and severe overgrazing, that seriously affected channel morphology were halted by the early 1900s (Wissmar et al. 1994). Nevertheless, the effects of past management activities clearly continue to affect channel morphology today.

The Aquatic Staff Area Report (1996) addresses the current status of stream channel morphology in the project area and relations to management actions through analysis of aquatic habitat inventories. These analyses include surveys of 105 streams inventoried in the 1940s and 1950s, and more than 6,000 stream inventories completed in the past five years that summarized stream conditions across a spectrum of physiographic environments and management histories. Key findings from analysis of both data sets are that stream channel morphology is highly variable, depending on stream type and biophysical environment, but there are major correlations between management intensity and stream channel morphology over time and space.

Aspects of channel morphology in the upper Columbia Basin that have apparently been affected by land management practices include the frequency of pools, the frequency of large pieces of wood in the channel, and the composition of substrate (amount of fine sediment). Low gradient (slopes less than two percent) and larger streams are apparently the most sensitive to management activities. Pool frequency and wood frequency are generally less in areas with higher road densities, and in areas where timber harvest has been a management emphasis. Additionally, where measured, the percent of the channel bed covered with fine sediment (less than 0.25 inches) increases with road density. These findings are consistent with observations from site-specific analyses that indicate that improper road construction, grazing, and timber harvest practices increase delivery of fine sediment to stream channels, filling pools and causing stream aggradation (Furniss et al. 1991; Hicks et al. 1991).

An example of changed riparian and aquatic environments is Marble Creek on the St. Joe River. In 1911, the river had numerous log jams that had been there for years. Shortly

Valleybottoms and Streamtype Settings in the UCRB Planning Area, by ERU

The dominant valleybottom settings of the Columbia Plateau ERU consist of steep, highly confined valleys and moderately steep to flat, moderately confined valleys. Steep, step-pool streamtypes are dominant, many of which are estimated to be unstable and high sources of sediment. Rapids and meandering pool-riffle streamtypes are also common, as well as a high local occurrence of braided streams. Entrenched, low gradient streams are also fairly common, many of which are unstable.

The Blue Mountains ERU has a similar dominant valley setting to the Columbia Plateau even though the landforms are different. Steep step-pool streams and mid-gradient rapid type streams dominate. Low gradient meandering and braided streams (Rosgen types C, E, and D) are moderately common across all watersheds within the ERU. Entrenched, low gradient streams are fairly common, many of which are unstable or in transition.

The Northern Glaciated Mountains ERU is dominated by steep confined and moderately steep, moderately confined valleys as well as flat unconfined valleys. Steep step-pool and cascade dominated streams, as well as mid-gradient rapid-type and meandering pool-riffle streams are all common throughout the ERU. This ERU has the highest occurrence of braided stream systems. It also ranks the highest across the project area for occurrence of wetlands and lakes.

The Lower Clark Fork ERU is dominated by steep confined valleys, moderately steep- moderately confined valleys, and flat unconfined valleys. Steep cascading and step-pool streams and meandering pool-riffle streams are the dominant streamtypes.

The Upper Clark Fork ERU is also dominated by steep confined and moderately steep-moderately confined valleys, but lack the flat unconfined valleys which co-dominate the Lower Clark Fork. Steep step-pool and mid-gradient rapid-type streams dominate; meandering low gradient streams have a patchy occurrence in roughly half the watersheds in this ERU. There is also a relatively high occurrence of low gradient sinuous streams (Rosgen type E) and a high percentage of wetlands and lakes.

The Owyhee Uplands ERU is dominated by flat moderately confined valleys but also has moderate and steep confined and moderately confined valleybottoms. The steep, mid-gradient, and low gradient streams are all well represented across the ERU. This ERU is uncommon in that it has a high occurrence of braided streams (both types D and DA) and is among the highest for low gradient sinuous streams. In addition it has a high occurrence of entrenched unstable streamtypes and unstable gullied streamtypes.

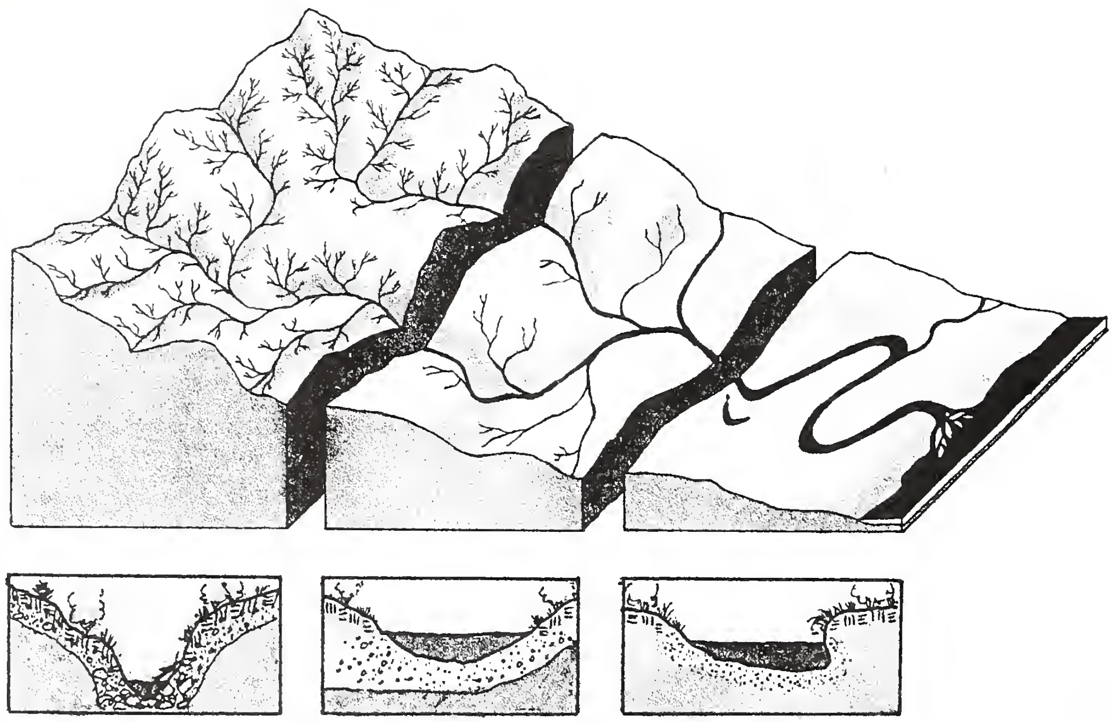
Valleybottom settings in the Upper Snake ERU are similar to those in the Owyhee Uplands. Mid-gradient, rapid-type streams dominate as well as steep step-pool and gullied streams. Braided streams are fairly common and low gradient sinuous pool-riffle streams occur locally. There is a high degree of channelized streams relative to the other ERUs.

The Snake Headwaters ERU is dominated by flat unconfined valleys, moderately steep-moderately confined valleys, and steep confined valleys, similar to the Owyhee Uplands and Upper Snake. The steep, mid-gradient, and low gradient streams are all well represented across the ERU. There is a high occurrence of braided streams, and steeper braided streams associated with alluvial fans. This ERU also has frequent occurrence of sinuous pool-riffle streams, and wetlands and lakes.

Dominant valley settings in the Central Idaho Mountains are steep confined valleys, moderately steep-moderately confined valleys, and flat moderately confined valleys. The steep, mid-gradient, and low gradient streams are all well represented across the ERU. This ERU is notable for the frequent local occurrence of braided streams, the extensive occurrence of sinuous pool-riffle stream (probably in association with glaciated areas), and the relatively common occurrence of entrenched unstable streams.

thereafter, the log jams were removed. Removing and salvaging logs from log jams peaked in Idaho and Montana in the 1920s, after which it was noted that the once numerous fish were no longer present.

In addition to these specific changes to streams and rivers, and those discussed in the Scientific Assessment (1996), land management practices have caused an overall change in the scale and frequency of landscape disturbance, resulting in a distinctly different character of watersheds and their stream systems when viewed from a regional perspective. Instead of individual and isolated watersheds, riparian areas, and stream channels being episodically affected by large disturbances, such as floods, fire, and insect infestations, with other neighboring watersheds remaining largely unaffected, past land management practices of widespread flow impoundment, road construction, improper livestock grazing, and timber harvest have led to increased levels of watershed disturbances spread over time and space. Consequently, most watersheds contain stream channels and aquatic habitats that are now subject to continuing cumulative effects of watershed disturbance. This contrasts with the more pulse-like pattern of disturbance with which most streams and associated species evolved. As a result, most stream channels are in a somewhat "unnatural" condition, with habitat conditions that are less than optimal for aquatic and riparian-dependent species, which evolved in environments that probably had many more high-quality habitat areas spread across the landscape.



Steep mountain headwater streams flow swiftly through and cut a deep "V" shaped valleys. Rapids, small pools and waterfalls are common and densly spaced.

Foothill streams flow through moderately confined valleys. Pools and riffles are common. The valley broadens and the river begins to meander.

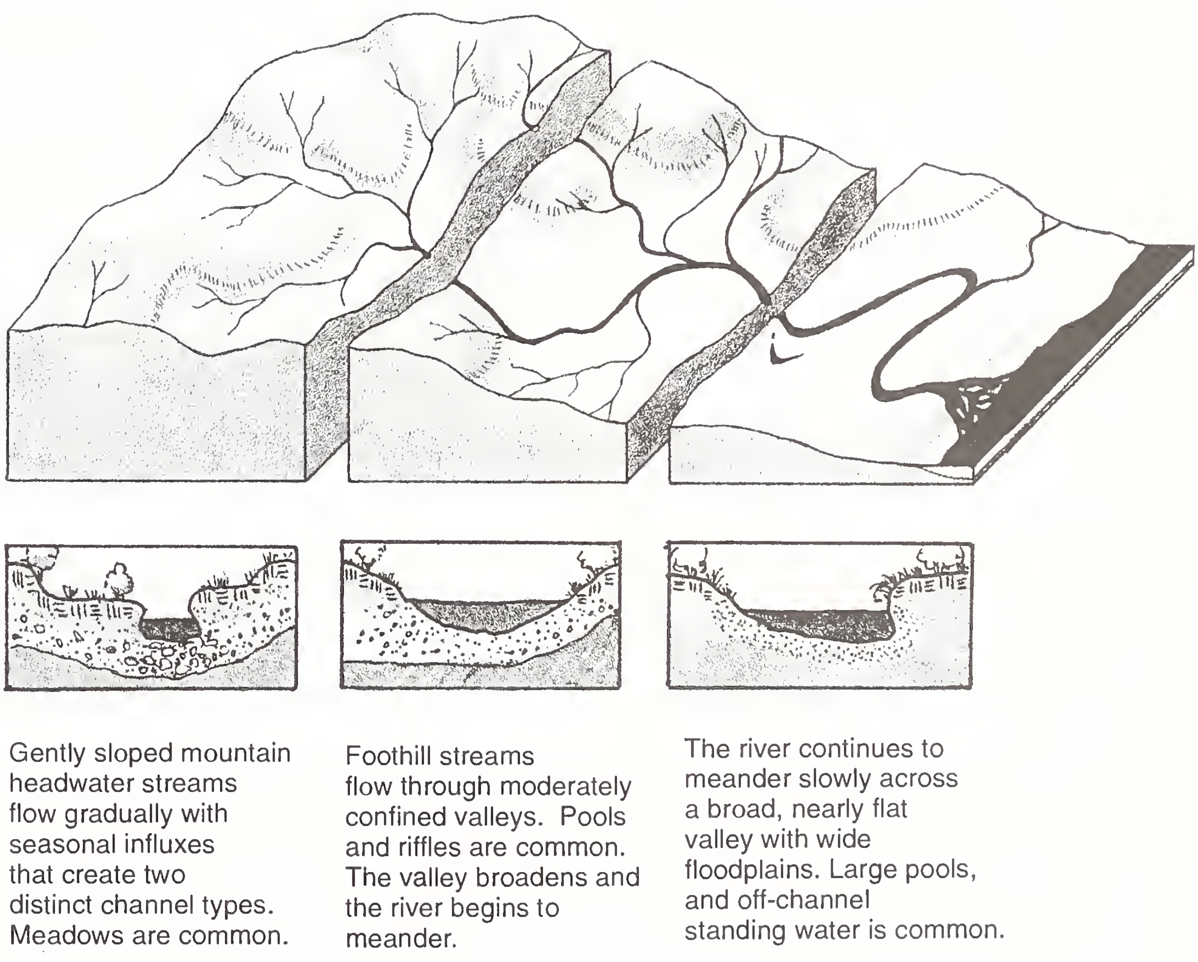
The river continues to meander slowly across a broad, nearly flat valley with wide floodplains. Large pools, and off-channel standing water is common.

Figure 2-18. Steep Mountain Headwaters Profile. Stream channels change in shape and velocity based on the steepness of the round slope and the amount of surface water. In general, steeper channels are commonly found in the headwater or mountainous portions of a landscape.

Improving trends in channel conditions have been documented within the UCRB planning area. For example, in the South Fork Salmon River in Idaho, studies showed a 78 percent reduction in the volume of stored sediment between 1965 and 1989. Excessive sedimentation resulting from a combination of extensive logging, road construction, and wildfire combined with large storm events during the winter of 1964–65, buried prime spawning and rearing habitat in the river. Following a moratorium on logging activities coupled with a watershed restoration and monitoring program, a large volume of fine sediment was moved out of the system. Not only was the volume of fine sediment reduced, but the size of particles on the streambed increased, indicating that the sources of sediment have stabilized to some degree (Bohn and Megahan 1991).

Lakes

Within the project area, lake conditions have been most affected by recreation and residential development. Recreation activities such as backpacking, horsepacking, recreational vehicle use, and road and trail development have resulted in damage to lake environments, particularly beaches and other near-shore areas. Recreation activities have commonly led to introduction of non-native plant and animal species, resulting in local extinction of native invertebrates, amphibians, and fish. Recreational boating has led to the introduction of numerous non-native plants, such as Eurasian watermilfoil. Large mid-elevation lakes, such as Priest and Payette Lakes in Idaho and Flathead Lake in Montana, have been the most affected from a growing regional population seeking to live or recreate near lakes.



Gently sloped mountain headwater streams flow gradually with seasonal influxes that create two distinct channel types. Meadows are common.

Foothill streams flow through moderately confined valleys. Pools and riffles are common. The valley broadens and the river begins to meander.

The river continues to meander slowly across a broad, nearly flat valley with wide floodplains. Large pools, and off-channel standing water is common.

Figure 2-19. Lower Elevation Headwaters Profile. Lower elevation headwater streams flow more slowly and create distinct channel types different from steep mountain headwater streams. Once the streams reach middle and lower gradients, the stream profile resembles that of the stream whose headwaters started in steeper mountains.

Water transfers and diversions for drinking water or irrigation water supply have affected and continue to affect many lakes throughout the project area, especially where drought and diversion of inflow have resulted in very low lake levels during the last several years. Dozens of moderate-sized lakes have their shorelines influenced by modification and control of their outlet streams or rivers. Regulation of lake level for water supply purposes has had effects on near-shore aquatic and wetland plant and animal communities, and the spawning success of near-shore spawning fishes. Additionally, inter-basin water transfers have promoted the continued spread of non-native plants and animals while inhibiting natural migration routes of native species.

Riparian Areas and Wetlands

Summary of Conditions and Trends

- ◆The overall extent and continuity of riparian areas and wetlands has decreased, primarily due to conversion to agriculture but also due to urbanization, transportation improvements, and stream channel modifications.
- ◆Riparian ecosystem function, determined by the amount and type of vegetation cover, has decreased in most subbasins within the project area.
- ◆A majority of riparian areas on Forest Service- or BLM-administered lands are either "not meeting objectives", "non-functioning", or "functioning at risk." However, the rate has slowed, and a few areas show increases in riparian cover and large trees.
- ◆Within riparian woodlands, the abundance of mid-seral vegetation has increased whereas the abundance of late and early seral structural stages has decreased, primarily due to fire exclusion and the harvest of large trees.
- ◆Within riparian shrublands, there has been extensive spread of western juniper and introduction of exotic grasses and forbs, primarily due to processes and activities associated with improper livestock grazing.
- ◆The frequency and extent of seasonal floodplain and wetland inundation have been altered by changes in flow regime due to dams, diversions, and groundwater withdrawal, and by changes in channel geometry due to sedimentation and erosion, channelization, and installment of transportation improvements such as roads and railroads.
- ◆There is an overall decrease in large trees and late seral vegetation in riparian areas.

Over the past 100 to 150 years, riparian areas and wetlands have been subject to increasingly concentrated and competing resource demands, including water withdrawal, mineral, sand and gravel extraction, human settlement, agricultural practices, timber harvest, livestock use, wildlife, and recreation. This has caused conflicts and complex issues that now confront agencies that manage riparian areas.

Riparian areas and wetlands cover a relatively small portion of the upper Columbia Basin. Their ecological significance, however, far exceeds their limited physical area. Riparian areas and wetlands are an important component of the overall landscape, forming some of the most dynamic and ecologically rich areas on the landscape (Elmore and Beschta 1987). Riparian areas exist in rangeland and forestland environments throughout the planning area (see figure 2-20). Riparian and wetland systems are responsive and dynamic, and when modified, can seriously affect adjacent aquatic and terrestrial ecosystems.

Riparian and Wetland Processes, Functions, and Patterns

Riparian areas are water-dependent systems that consist of lands along, adjacent to, or contiguous with streams, rivers, and wetland systems (see figure 2-20). Riparian ecosystems are the ecological links between uplands and streams, and between terrestrial and aquatic components of the landscape. Many riparian areas have wetlands associated with them. While riparian areas are defined primarily on

the basis of their nearness to streams and rivers, wetlands occur wherever the water table is usually at or near the ground, or where the land is at least seasonally covered by shallow water. Wetlands in the project area include marshes, shallow swamps, lake shores, sloughs, bogs, and wet meadows. They are an important part of the overall landscape, providing major contributions to ecosystem productivity, and structural and providing biological diversity, particularly in drier climates (Elmore and Beschta 1987).

Within the interior Columbia Basin, wetlands constitute a very small portion of the total land area ~ less than 1.5 percent. Many wetlands have been drained, filled, pumped dry, or otherwise degraded or lost. About 60 percent of the historical wetlands remain within the basin, compared to a national wetland area of 50 percent of historical. Most of the wetland loss is a result of historical draining for agriculture and farming, but smaller wetlands within forest and rangeland riparian areas have been altered or lost from road placement within valleybottoms and other causes. Many small and isolated wetlands exist in alpine areas in the Blue Mountains and Northern Glaciated Mountain ERUs. These are commonly remnants of small lakes that were formed by glaciation, landslides, or lava flows.

Physical Processes in Riparian Areas and Wetlands

Important physical processes in riparian areas primarily related to the interactions between stream channels, adjacent valley bottoms, and riparian vegetation, which depends on the frequency of floodplain inundations (flooding). Water that infiltrates into the floodplain during periods of high flow, returns to the channel during periods of low flow, contributing a cool source of summer base flow for many streams, especially in low-elevation alluvial valleys. Seasonal inundation of the floodplain results in overbank deposition and enrichment of riparian soils. Inundation of floodplain also reduces water velocities during flooding and aids in reducing downstream flood peaks, both factors that reduce the risk of channel erosion. Inland wetlands perform many of the same functions, such as detaining storm runoff, reducing flow peaks and erosion potential, retaining and filtering sediment, and augmenting groundwater recharge by storing water and releasing it more slowly, later into the dry season.

Riparian vegetation also plays a role in many physical processes within riparian areas. Vegetation shades streams and moderates water temperatures by helping keep waters cool in the summer and providing an insulating effect in the winter. Densely vegetated riparian areas buffer the input of sediment from hillslopes and filter fertilizers, pesticides, herbicides, and sediment from runoff generated on adjacent lands. Riparian vegetation also promotes bank stability and contributes organic matter and large woody debris to some stream systems, which is an important component of instream habitat conditions (Gregory et al. 1991; Henjum et al. 1994; Hicks et al. 1991; Kovalchick and Elmore 1992; Sedell et al. 1990). Complex off-channel habitats, such as backwaters, eddies, and side channels, are

Wetlands ~ A Definition

The U.S. Army Corps of Engineers, Environmental Protection Agency, Fish and Wildlife Service, and Natural Resource Conservation Service worked together to develop common language and criteria for the identification and delineation of jurisdiction wetlands in the United States (Federal Interagency Committee for Wetland Delineation 1989). The four Federal agencies defined wetlands as possessing three essential characteristics: (1) hydrophytic vegetation, (2) hydric soils, and (3) wetland hydrology, which is the driving force creating all wetlands. The three technical characteristics specified are mandatory and must all be met for an area to be identified as a wetland. Hydrophytic vegetation is defined as plant life growing in water, soil, or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content. Hydric soils are defined as soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic (without oxygen) conditions in the upper part of the soil profile. Generally, to be considered a hydric soil, there must saturation at temperatures above freezing for at least seven days. Wetland hydrology is defined as permanent or periodic inundation, or soil saturation to the surface, at least seasonally. The presence of water for a week or more during the growing season typically creates anaerobic conditions in the soil, which affects the types of plants that can grow and the types of soils that develop (Hansen et al. 1994).

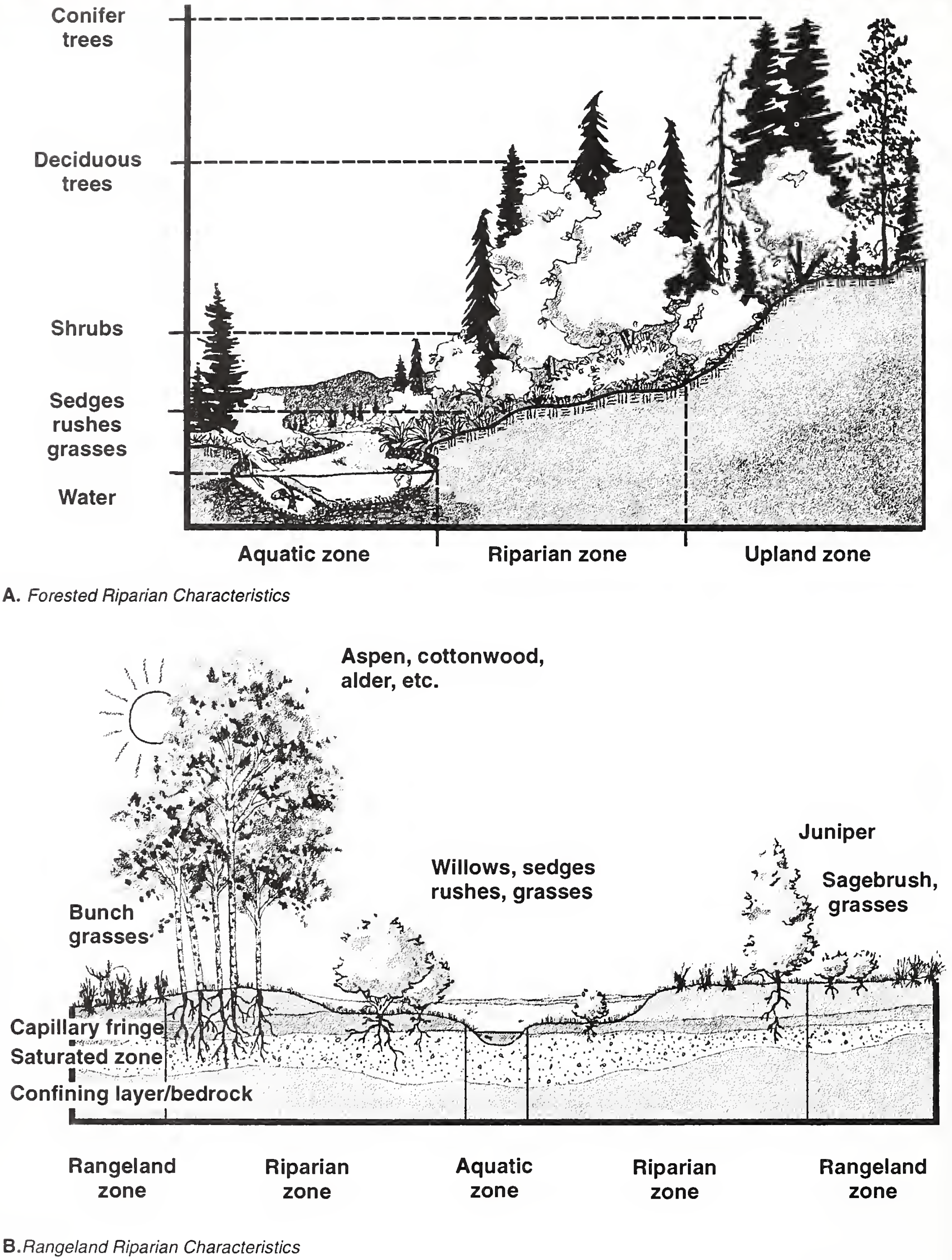


Figure 2-20. Forested and Rangeland Riparian Characteristics

often formed by the interaction of streamflow and riparian features such as living vegetation and large woody debris (Gregory et al. 1991). These areas of slower water provide critical refuge during floods for a variety of aquatic species, and serve as rearing areas for juvenile fish. Additionally, streams and riparian areas are dynamic and change in response to upslope and broader landscape processes and disturbances. These disturbances may influence stream pattern and profile, but typically valley width and gradient do not change. Valleybottoms are generally stable physical settings which contain dynamic components of stream types and riparian vegetation (Manning 1995). The shape, size, steepness, of the valleybottom and stream corridor side-slopes have profound effects on the development of in-stream morphology and aquatic habitat (Cupp 1989).

Riparian and Wetland Vegetation

Most riparian and wetland areas within the project area stand out because of their unique vegetation. In drier regions, ribbons of dense vegetation flank streams and rivers, in distinct contrast to the surrounding uplands and valley bottoms.

The broad-scale analysis of vegetation conducted as part of the Science Assessment (1996) identified three potential vegetation groups associated with riparian areas: riparian woodland (dominated by cottonwood, aspen, ponderosa pine, and Douglas-fir), riparian shrub (dominated by alder and willow), and riparian herb (including sedges, forbs, and grasses). Because riparian vegetation grows in thin strips along streams and rivers, it was difficult to accurately determine the areal extent using a broad-scale analysis during the Assessment. Consequently, the three potential vegetation groups have been lumped into one group (riparian potential vegetation group) for descriptive, management, and analytical purposes in this EIS.

Under natural conditions, riparian plant communities have a high degree of structural and compositional diversity, reflecting the history of past disturbances such as floods, fire, wind, grazing, plant disease, and insect outbreaks (Gregory et al. 1991). Historically (prior to the 1900s), disturbance regimes along riparian areas were dominated by floods and fires, with some grazing by native ungulates (large, hoofed mammals, such as deer, elk, and antelope). Within the riparian woodland potential vegetation group, fires were normally infrequent but severe, occurring at 65- to 150-year recurrence intervals when there were appropriate weather, fuel, and ignitions conditions. In the riparian shrub potential vegetation group, fire was typically more frequent, occurring every 25 to 50 years (Landscape STAR 1996). Because predators typically used riparian habitat as cover, native ungulates typically remained on the uplands and only made dispersed visits to riparian areas for water. However, during drought periods, riparian areas were more intensively grazed by native ungulates.

Photo 16. Riparian vegetation plays an important role in stream process and function. Photo by Doug Basford.

Riparian Terrestrial Species and Habitats

Riparian areas contain the most biologically diverse habitats on Federal lands, attributable to a variety of structural features including live and dead vegetation and close proximity of riparian areas to water bodies. Riparian areas are valuable to wildlife for food, cover, and water (Bull 1977; Thomas et al. 1979), and provide important habitat for over half of the wildlife species in the upper Columbia Basin. For example, of the 378 terrestrial species known to occur in the Blue Mountains, 75 percent either directly depend on riparian areas or use them more than other habitats (Thomas et al. 1979). Riparian areas provide nesting and brooding habitat for birds. They also provide thermal cover and favorable microclimates due to increased humidity, a higher transpiration rate, shade, and increased air movement helping in homeostasis (a condition where energy expenditure is minimized), especially when surrounded by non-forested ecosystems (Thomas et al. 1979). Common deciduous trees and shrubs in riparian areas, such as cottonwood, alder, willow, and red osier dogwood, are important food sources for mammals such as deer, elk, moose, hares, rabbits, voles, and beavers, as well as other animals. In riparian areas that consist of aspen and cottonwood, which incorporates herbaceous and shrubby components, 24 species of amphibians, 145 species of birds, 62 species of mammals, and 10 species of reptiles are found (Terrestrial Staff Database 1996). Riparian areas also serve as big game migration routes between summer and winter range; provide travel corridors or connectors between habitat types for many terrestrial species such as carnivores, birds, and bats; and play an important role within landscapes as corridors for dispersal of plants (Bull 1977; Gregory et al. 1991; Heinemeyer and Jones 1994; Thomas et al. 1979; Vogel and Reese 1995; Washington Department of Fish and Wildlife 1995).

Riparian habitat is used by more bird species than any other habitat type within the project area (Neotropical Migratory Bird Report in press 1996). Fifteen neotropical migrant bird species (species that breed in North America and winter in Central or South America) use riparian habitat either exclusively or in combination with only one other habitat type. Within the project area, 84 of the 132 breeding migrant birds use riparian vegetation for nesting or foraging. Riparian vegetation was used by more species of neotropical migrant birds (64 percent) than any other habitat (Saab and Rich 1995).

Cottonwood, willow, and aspen are critical food for beavers. Before the 1900s, prior to being trapped to very low population levels, beavers were a critical component of nearly all riparian areas with perennial streams. Beaver activity can significantly affect physical processes and habitat conditions withing riparian areas. Beaver dams lead to flooding and expansion of floodplains, and the creation of wetland-riparian

Photo 17: Riparian areas serve as migration routes for elk and other big game between summer and winter ranges. These areas are also valuable for other wildlife for food, cover, and water. Photo by USFS.

areas. These features help dissipate the erosive power of floods, trap sediment, and affect the plants and animals associated with these areas. Beaver ponds provide and promote important habitat for many birds, mammals, and fish.

Wetlands also provide important habitat for a variety of species, including resident and migratory birds (for example, swallows, flycatchers, waterfowl, and shorebirds), mammals (for example, bats, ungulates, and beavers), unique plant species (for example, cattails, sedges, rushes, pond lilies, and willows), amphibians (for example, salamanders and frogs), invertebrates (for example, caddisflies, mayflies, and dragonflies), and fish (for example, chubs, suckers, and dace). Approximately 35 percent of the rare and endangered, threatened, and sensitive plant and animal species in the United States either reside in wetland areas or are otherwise dependent on them. Within the planning area terrestrial vertebrate species associated with wetland habitats include 28 neotropical migrant birds, 26 amphibians, and 2 reptiles (Terrestrial Database 1996). Seasonal wetlands are often shallow and fill up quickly in early spring with the onset of groundwater recharge or thawing conditions. These areas provide critical habitat for birds because conditions are favorable for production of invertebrates, an important food supply for migratory birds. Permanent wetlands are usually deeper water bodies that provide habitat and food for animals throughout the spring and summer.

Current Conditions of Riparian Areas and Wetlands

Fur trappers, early surveyors, and settlers during the early 1800s reported extensive stands of cottonwoods, willows, and alders growing across valleys and along moist gulches and draws; and wide, wet meadows along stream systems throughout the project area. Today, many riparian areas and wetlands are considerably altered from conditions noted by the first explorers.

Riparian Areas

In the western United States, 66 percent of inventoried BLM-administered riparian areas are either "non-functioning" or "functioning at risk" as defined in the process for assessing Proper Functioning Condition. Likewise, more than 75 percent of riparian areas administered by the Forest Service in the western United States are not "meeting or moving toward objectives" (Rangeland Reform '94 Draft EIS).

Key broad-scale trends identified in the Scientific Assessment (Landscape Ecology STAR 1996) are that riparian areas have been reduced in abundance and that there has been a significant increase in habitat fragmentation. Conversion of shrublands to cropland in deep soil areas, and to pastureland elsewhere, have been major factors reducing the present extent of riparian areas.

Proper Functioning Condition - A Definition

In response to the growing concerns over the integrity of ecological processes in many riparian areas and wetlands, the BLM has developed a process for assessing "Proper Functioning Condition." The BLM's Riparian-Wetland Initiative for the 1990s (USDI 1991) establishes national goals and objectives for managing riparian-wetland resources on BLM-administered lands. This initiative's two-part goal is to: (1) restore and maintain existing riparian-wetland areas so that 75 percent or more are in Proper Functioning Condition by 1997, and (2) to achieve and provide the widest variety of habitat diversity for wildlife, fish, and watershed protection.

Riparian-wetland areas achieve Proper Functioning Condition when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high water flows. This thereby reduces erosion and improves water quality; filters sediment, captures bedload, and aids floodplain development; improves floodwater retention and groundwater recharge; develops root masses that stabilize streambanks against cutting action; develops diverse ponding and channel characteristics to provide habitat and water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses; and supports greater biodiversity. The functioning condition of riparian-wetland areas is a result of the interaction among geology, soil, water, and vegetation (USDI 1993).

The major areas of riparian vegetation loss are in riparian shrubland, riparian woodland, and large riparian trees. Over the basin, 75 percent of the riparian shrublands have been lost in the past 75 years. The Blue Mountains, Owyhee Uplands, Columbia Plateau, Central Idaho Mountains, and Upper Snake ERUs have had the greatest losses. Parts of the Blue Mountains and Central Idaho Mountains historically had low abundance of riparian shrubland and have lost the majority of what was there. Most losses occurred on non-federally administered lands and are the result of land conversion to agriculture, inundation by reservoirs, and urban development, but some loss is the result of succession into forest cover types such as juniper, ponderosa pine, and Douglas-fir, mainly from fire exclusion. Riparian woodland areas have also declined, but to a lesser degree than shrublands. Loss of riparian woodland is most pronounced in the Owyhee Uplands, Upper Snake, and Snake Headwaters ERUs.

Another evident pattern is change in successional and structural stage development, often associated with fire exclusion and suppression combined with the harvest of large trees. This pattern is typified by the replacement of large, dominant, and persistent early seral tree species, notably ponderosa pine and western larch, with more shade-tolerant, late seral, smaller species including Douglas-fir, grand fir, and white fir. Also noteworthy is the reduction in the large tree component and late successional vegetation common across all ERUs, but is most pronounced in the Columbia Plateau and Snake Headwaters. In the Northern Glaciated Mountains and Lower Clark Fork ERUs, the large tree component in the riparian area increased. Some areas sampled showed an increase in riparian cover and large tree component although most sites were far below meeting the potential riparian vegetation and function.

Other patterns include the conversion of low–medium shrublands to juniper woodlands and to exotic grasses and forbs. The combination of grazing, reducing ground cover and fine fuels, and fire suppression and exclusion, have provided large areas for the establishment and development of juniper woodlands. Expansion of western juniper, particularly in the Blue Mountains ERU, has affected the rate of water interception and transpiration. Similarly, surface disturbance from heavy grazing combined with fire suppression have resulted in extensive establishment of exotic grasses and forbs.

One other relatively uncommon, but ecologically important pattern is the conversion of the aspen/cottonwood/ willow (riparian woodland) type to conifer vegetation types, mainly Douglas-fir. The riparian woodland types are rare and have been greatly reduced from historical abundance.

On Forest Service- or BLM-administered lands within the planning area, major factors contributing to the decrease in riparian area function are improper livestock grazing, timber harvesting, fire management, conversion to crop and pastureland, road development, and dams, diversions, and/or pumping. On rangelands, improper livestock grazing has been the most important factor affecting riparian areas. On forested landscapes, silvicultural practices (including fire suppression) and road building have had the highest effects on riparian areas. Most of these activities have affected riparian area processes and functions by changing flow regimes and channel geometry, thus resulting in changed interactions between the channel and floodplain; and by changing the structure, pattern, and composition of riparian vegetation, thereby changing the functions and habitats provided by native riparian vegetation.

To a lesser extent, disturbances associated with recreational uses, urban development, and mining have also contributed to the decrease in functioning riparian areas. Increasing awareness of the importance of riparian areas to ecological health and resiliency of forest and rangeland ecosystems has resulted in halting and mitigation of many practices that have adversely affected the function of riparian areas.

Although declining riparian conditions occur in many areas, over the past decade land management agencies, working cooperatively with the land users, have concentrated restoration efforts in riparian areas, and many areas are recovering. An example of improved rangeland riparian condition is the Big Cottonwood Creek watersheds on the Sawtooth National Forest in Idaho, where an improving trend has occurred in the past five to seven

Big Cottonwood Creek ~ Then and Now

Photo 18A: 1986. Big Cottonwood Creek, Twin Falls Ranger District. Mature trees are mostly dead, and there's no regeneration of willow or cottonwood due to heavy browsing by cattle. Photo by USFS/Sawtooth NF.

Photo 18B: 1990. Total rest in 1988 and 1989 and light fall use in 1990 allowed release of willow and cottonwood. Photo by USFS/ Sawtooth NF.

Photo 18C: 1992. Light use in the spring of 1991, and spring use in 1992. 400 cow-calf pairs used this unit for 10 days just prior to this photo being taken. Photo by USFS/ Sawtooth NF.

years. Bare soil and muddy wet areas are now covered with grasses, with wetlands being created and willows growing along the streambank. The improvement has resulted from improved management by the permittees.

Although total exclusion of livestock has been shown to improve conditions in riparian areas, land managers also can accomplish riparian area improvement with the presence of livestock grazing if there is an increased emphasis on compliance with suitable grazing strategies and practices. There are no cookbook or "one size fits all" prescriptions for livestock grazing in riparian areas, but Karl and Leonard (in prep) provide a review of many practices that can be used individually or in combination depending on the situation. In general, season-long (continuous), spring and fall, spring and summer, or summer grazing are not recommended strategies for producing successional advancement of riparian vegetation. Grazing during these times does not allow for residual vegetative cover to protect stream banks from floods and to collect sediment for building banks and narrowing the stream channel. In addition, vegetative structure such as different age classes of shrubs and trees is normally reduced when grazing occurs during these seasons. In general, it is recommended that grazing occurs during times when cattle do not congregate in riparian areas, such as in the spring when green forage is available on the uplands, temperatures are cool, and sufficient time is available for regrowth of riparian vegetation.

Wetlands

Since European settlement, many wetlands on private lands have been drained, filled, sprayed with herbicides and pesticides, or logged, primarily to develop lands for agriculture, but also for residential, commercial, and industrial development. Most of the remaining high quality wetlands in the project area are on BLM- or Forest Service-administered lands, primarily in alpine or sub-alpine environments, and on other federally managed lands such as National Wildlife Refuges managed by the U.S. Fish and Wildlife Service.

Artificial wetlands contribute significantly to wetland habitats within the planning area. These areas, such as Malheur Lake in eastern Oregon and those in the Columbia Plateau (ERU 6), were created by flow impoundment, irrigation ponds, stream diversion, and agricultural wastewater. Additionally, wetland habitats have been affected by the invasion of non-native plants (such as purple loosestrife, saltcedar, and Russian olive) and introduced animals (such as bullfrogs). On many sites, these non-native species have become well established, commonly replacing native species or exerting large influences on the functional dynamics of existing native habitats.

Fish

Summary of Conditions and Trends

- The composition, distribution, and status of fishes within the planning area are different than they were historically. Some native fishes have been extirpated from large portions of their historical ranges.
- Many native nongame fish are vulnerable because of their restricted distribution or fragile or unique habitats.
- Although several of the key salmonids are still broadly distributed (notably the cutthroat trouts and redband trout), declines in abundance, the loss of life history patterns, local extinctions, and fragmentation and isolation in smaller blocks of high quality habitat are apparent.
- Wild chinook salmon and steelhead are near extinction in a major part of the remaining distribution in large part because of the construction and operation of mainstem dams on the Columbia and Snake rivers.
- Habitat, hydropower, harvest and hatchery management, and irrigation withdrawals all affect the survival of remaining anadromous fish populations within the interior Columbia River Basin to different extents. Land management activities have the affected habitat for wild chinook and steelhead and have limited their spawning and rearing success. The contribution of freshwater habitat to declines in anadromous fish populations would be least in central Idaho (for example wilderness areas and other

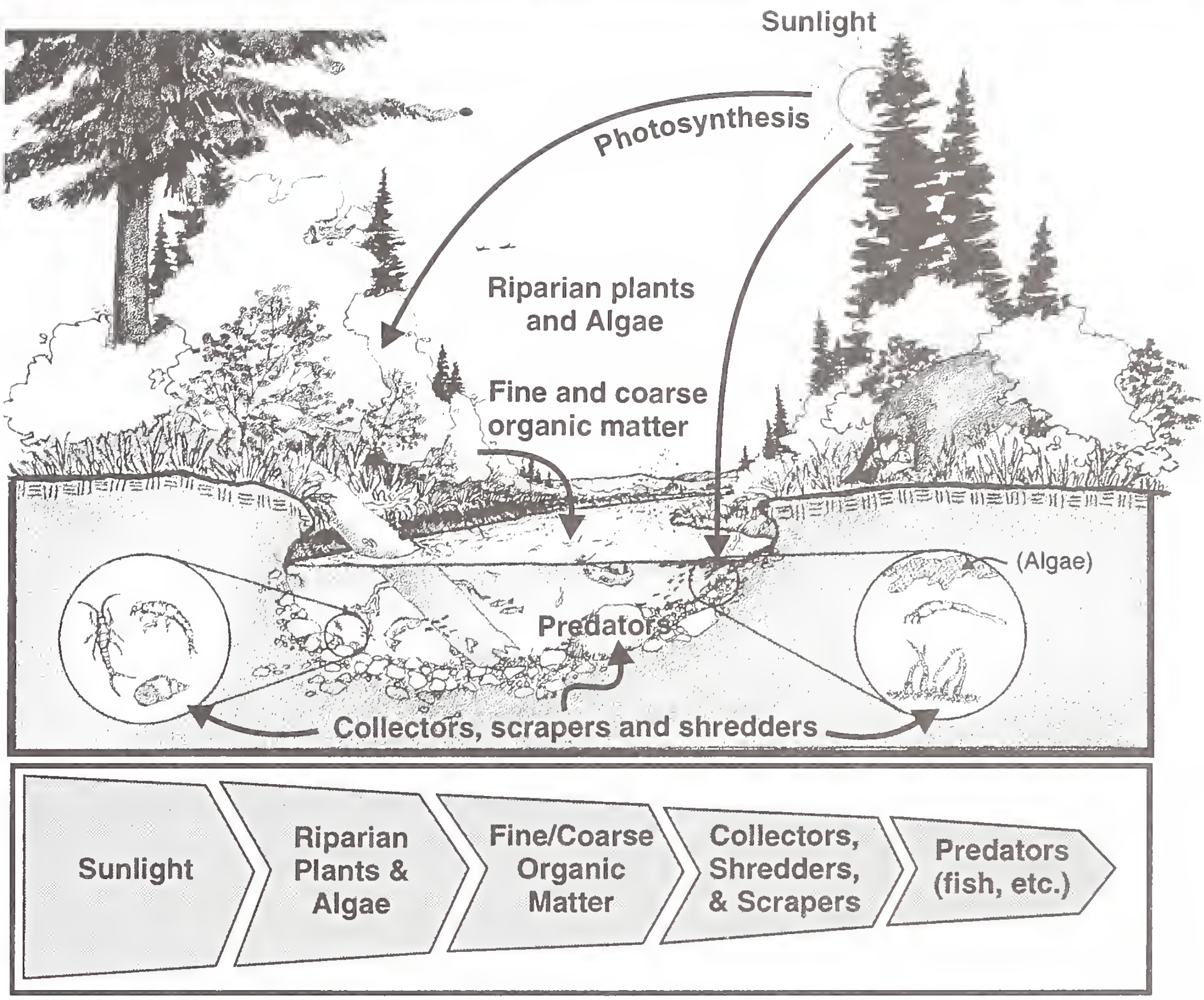


Figure 2-21. Aquatic Food Web. Fish are key components of aquatic ecosystems, where complex food webs include both aquatic and terrestrial plants and animals.

protected areas), which is affected by the most dams between spawning and rearing areas and the ocean, and the northern Cascades, but greater in the lower Snake and mid-columbia drainages. The influence of hydropower on anadromous fish populations increases upriver where there are more dams between freshwater spawning and rearing areas and the ocean. Harvest, which has been curtailed in recent years, has less effect today than it did historically. Hatcheries are an important element throughout the basin, but their effect on native stocks is variable.

- Core areas for rebuilding and maintaining biological diversity associated with native fishes still exist within the planning area.

Fish are the dominant aquatic vertebrate and a key component of aquatic ecosystems in the project area (figure 2-21, Aquatic Food Web). Fish are a critical resource to humans and have influenced the development, status, and success of social and economic systems within the project area. Fish are sensitive to disturbance, thus integrating the effects of landscape and watershed processes over large regions. The diversity and integrity of native fish communities provide useful indicators of aquatic ecosystem structure, function, and health.

Current Conditions

Like many portions of western North America, the project area has a moderately sized, locally

diverse fish fauna. The varied characteristics and distribution of native fishes mirror the diverse and dynamic physiography and geologic history of the region. The native fish fauna of the Columbia River drainage is unusual in that it clearly is not a single faunal unit, but rather is composed of several subbasin faunas with limited species overlap among subbasins. There are presently 142 recognized fish species, subspecies, or races reported within the project area.

Six aquatic snails federally listed as endangered or threatened are found in the project area (Frest and Johannes 1995), including the endangered Banbury Springs lanx (*Lanx* sp.), Snake River physa (*Physa natricina*), Idaho springsnail (*Pyrgulopsis idahoensis*), Bruneau hot springsnail (*Pyrgulopsis bruneauensis*), and Utah valvata (*Valvata utahensis*); and the threatened Bliss Rapids snail (*Taylorconcha serpenticola*). According to Frest and Johannes (1995), the lanx, Bliss Rapids snail, and Utah valvata may occur on BLM-administered lands in Idaho. All of these three latter species are local endemics with limited distribution and numbers; the major threats to these species are linked primarily to agriculture and river impoundments.

A recovery plan has been developed and approved for five listed Snake River snails that includes delineation of recovery areas. See Appendix E for recovery area maps.

Native Species

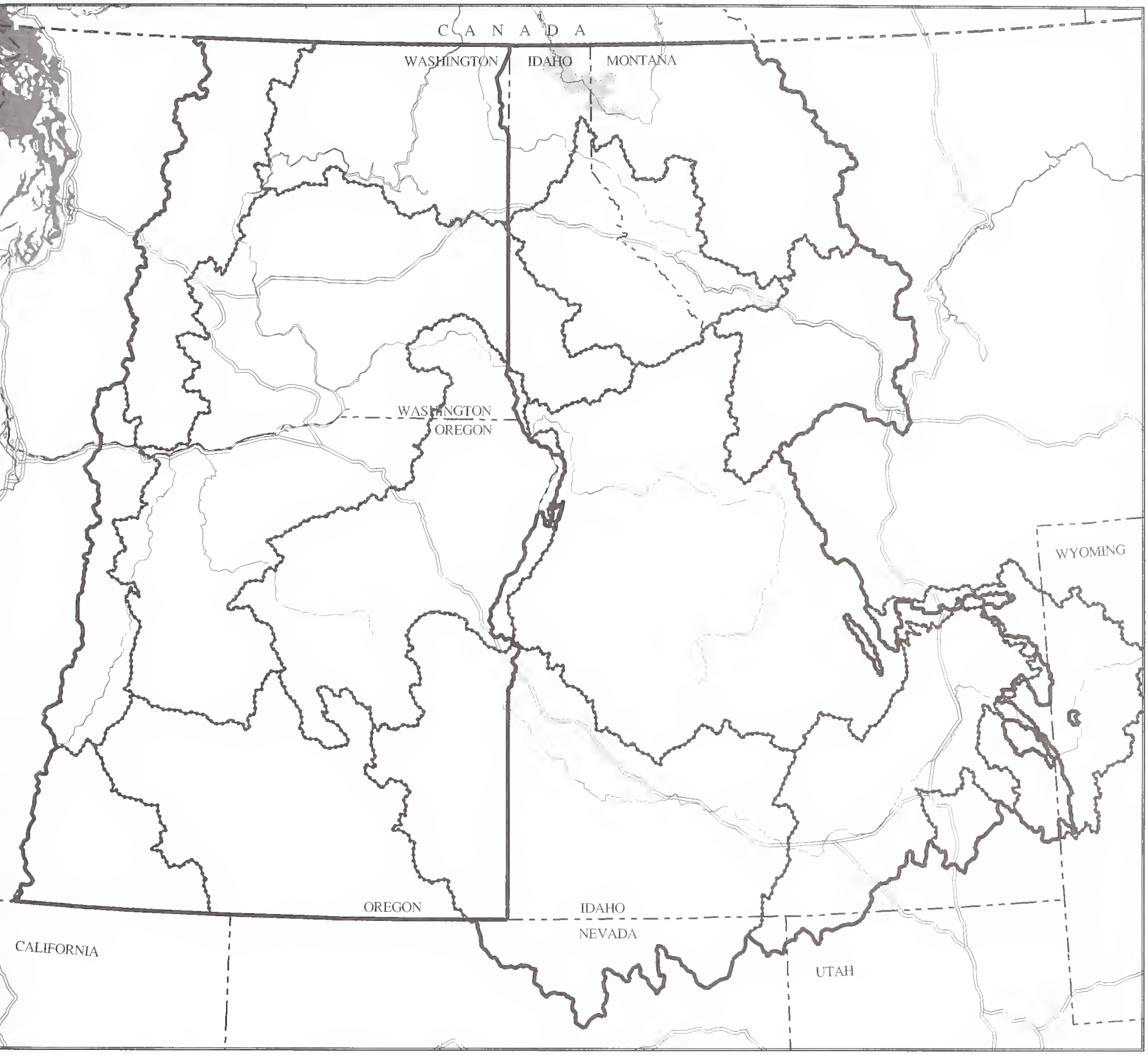
Eighty-seven of the project area fish species are native (55 species are non-native). Compared to other large river systems, species richness (number of species) within the project area is quite low, which may be a reflection of the isolation and geologic history of the project area compared to other large river basins with greater species richness.

Native fish species tend to fall into two groups. The first group consists of 15 to 20 species that are widely distributed throughout the basin or are reported in 20 percent or more of the project area. The second group of roughly 60 species includes the narrow endemic or rarer species that have restricted ranges or are infrequently reported. These species are generally found in less than 5 percent of the project area. These species, commonly called narrow endemic species, are found principally in Oregon and southern Idaho. Many of these species are associated with closed basins and many are truly isolated in relatively small watersheds.

In individual watersheds (fifth-code hydrologic units) within the project area, the total number of native species ranges from zero to 28. The largest number of native species is found in the large river corridors, particularly the lower and mid-Columbia and lower Snake rivers. Fewer native fish species are found in headwater watersheds in the Blue Mountains (ERU 6) and in the Columbia River Basin in western Montana.

Many species of native fish and other aquatic biota in the project area are considered imperiled. There are 47 special status species in the project area. Special status species include federally listed endangered or threatened species; candidate species for Federal protection; species recognized for special protection by the States of Oregon, Washington, Idaho, and Montana; species managed as sensitive species by the Forest Service and/or BLM; and species recognized by the American Fisheries Society. Ten species in the project area are formally listed under the Endangered Species Act of 1973; three qualify for listing (Category 1 - bull trout, coho salmon, and summer basin tui chub); and one has been petitioned for listing (steelhead). Within the UCRB planning area, two species are listed endangered under the Endangered Species Act: white sturgeon (Kootenai River), and sockeye salmon (maps 2-11 and 2-12); one species (fall/spring/summer chinook salmon [maps 2-22 and 2-23, later in this section] is listed as threatened.

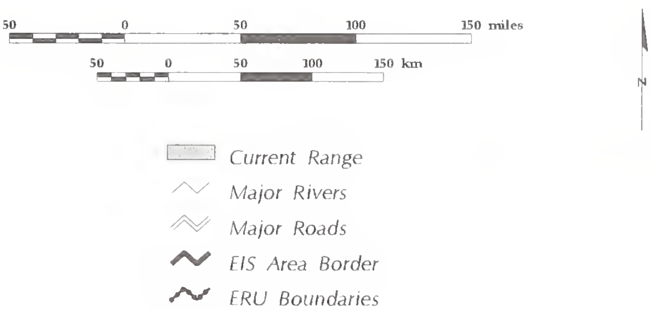
The list of special status species in the UCRB includes the white sturgeon (Acipenseridae); five lampreys (Petromyzontidae); sockeye, chum and coho salmon (Salmonidae); coastal and Lahontan cutthroat trout (Salmonidae); pygmy whitefish (Salmonidae); burbot (Gadidae); 11 minnows (Cyprinidae); six suckers (Catostomidae); eight sculpins (Cottidae); and Sunapee char, an important introduced species. Twenty-two of these species occur in the Great Basin and Klamath Basin portions of the project area. Within the Columbia River Basin, eight occur entirely or primarily in the mainstream river system, three are restricted to the upper Snake River system (including the Wood River), two are restricted to



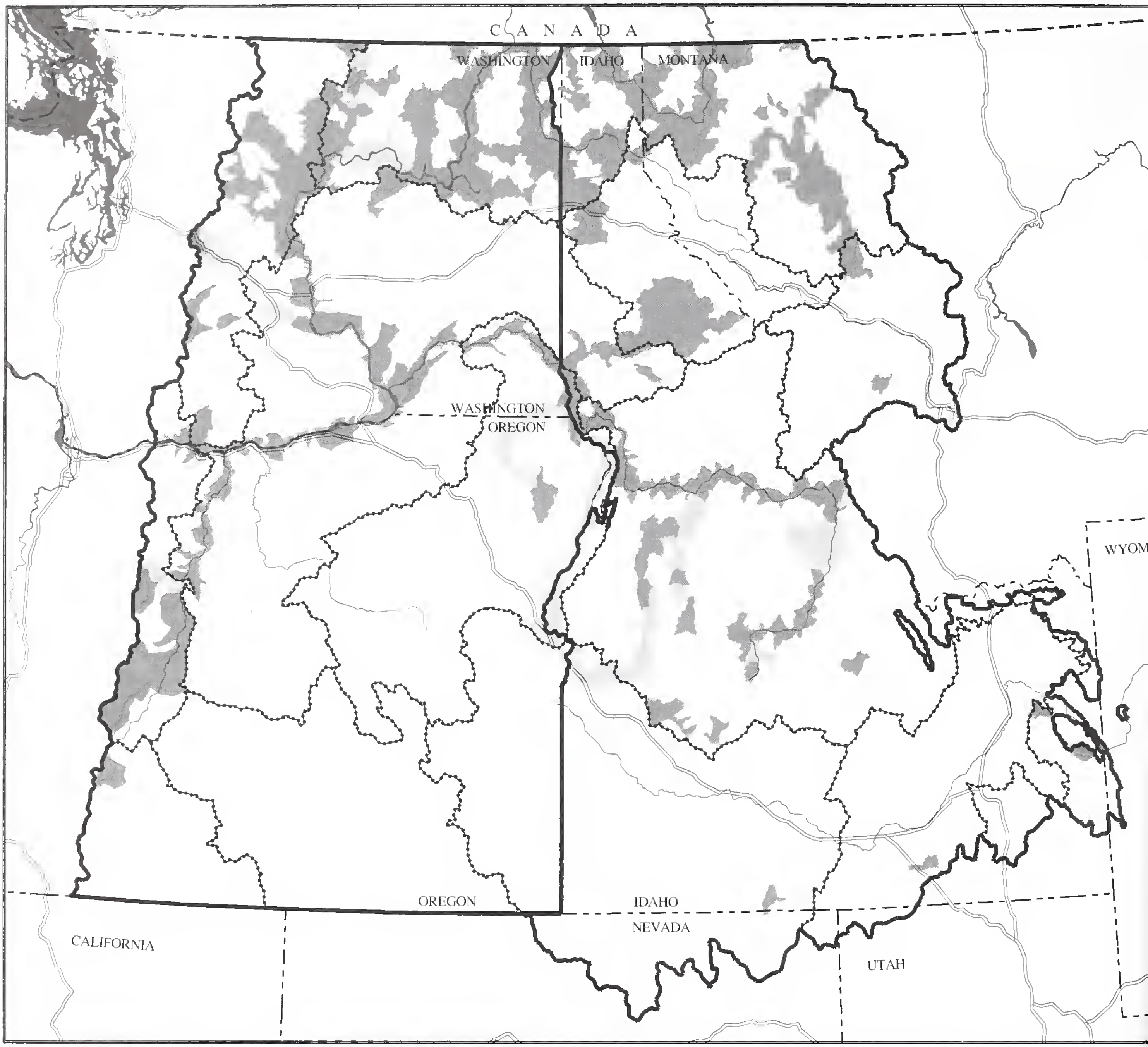
Map 2-11. Distribution of White Sturgeon

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Project Area
1996



*Ecological reporting unit names and numbers are found on Map 1-1.



Map 2-12. Distribution of Sockeye (Kokanee) Salmon

50 0 50 100 150 miles

50 0 50 100 150 km

N

Historical Range
Current Range
Major Rivers
Major Roads
EIS Area Border
Ecological Reporting Unit Border*

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996

*Ecological reporting unit names and numbers are found on Map 1-1.

the upper Columbia River (primarily in the Northern Glaciated Mountains ERU 7), two occupy streams in the middle and upper Columbia Basin, and one is restricted to the Blue Mountains in the middle Columbia River Basin. Twenty-five species, excluding the key salmonids, occur on more than one Forest Service or BLM administrative unit.

Many factors contribute to the current condition of depressed populations and reduced distribution of native species. Hydroelectric development disrupts migration of anadromous forms. Irrigation diversions and water withdrawal, and the loss of wetlands, marshes, and interconnected waterways, alter habitats for many species, especially in arid regions. Silvicultural practices, improper livestock grazing, and urbanization degrade habitat by changing flow patterns, changing patterns of sedimentation and erosion, increasing water temperatures, and causing eutrophication. Especially threatened are those species dependent on springs. Introduced species have also affected native fish by competition, predation, or hybridization.

Management of many special status fishes is hindered by a lack of basic information. The best information is for the salmonids, or for a few select species that have attracted the attention of researchers. In many cases, species distribution, life history, and habitat characteristics are uncertain. More detailed information for wide-ranging salmonids is presented in a subsequent section.

Introduced Species

In addition to the native fishes, numerous non-native fish species now occupy the project area. Most of these non-native species have been purposely introduced to promote sport fishing opportunities. Introduced salmonids (such as hatchery rainbow trout), centrarchids (such as bass and sunfish), and percids (such as walleye) now support much if not most of the sport fishing opportunity in the project area. The introduced species are now permanent components of the aquatic ecosystem with social and economic importance. They tend to be well-adapted to altered conditions in aquatic environments, and have contributed to the decline of native fish and other native aquatic organisms through competition, predation, and hybridization.

Some of these non-native fish species are now widespread. The most frequently reported fish species in the project area is the introduced rainbow trout, occupying 78 percent of the watersheds in the project area. Introduced brook trout are also well distributed, occupying 50 percent of the watersheds in the project area. Sixteen (32 percent) of the 50 most-reported species are introduced game fishes.

Recreation centered on non-native fisheries is highly valued within the project area, and many watersheds support important wild trout fisheries for introduced salmonids such as brook, brown, rainbow, and lake trout. Habitat in these watersheds remains suitable for natural reproduction of salmonids, although native salmonids may be depressed or extinct because of displacement by non-native fish. For example, in the Henrys Fork of the Snake River, Idaho, native Yellowstone cutthroat trout are virtually extinct in large portions of their historical range, yet wild, self-sustaining populations of introduced rainbow trout thrive and support an internationally recognized trophy trout fishery. Similarly, the upper Deschutes River in Oregon is a renowned wild trout fishery of non-native brook, brown, rainbow, and lake trout that has at least partly displaced native salmonids.

Salmonids

Historical Overview

Salmon, perhaps more than any other single resource, have helped define the Pacific Northwest. Historically, salmon occurred in nearly every stream and river not blocked by major falls. Most American Indians in the project area shared a major dependence on salmon as a subsistence and ceremonial resource. When the first European settlers arrived during the early 1800s, salmon were abundant and diverse. Estimates of historical run size for all species of salmon and steelhead in the Columbia River range from 10 to 16 million adults. The first commercial cannery operations began on the Columbia in 1866 and soon exceeded sustainable levels. Commercial catches of chinook salmon peaked during 1883, when 43 million pounds of fish were landed. Coho, sockeye, chum, and steelhead were also abundant in the Columbia River Basin. The catch of coho salmon peaked at 6.8 million pounds in 1895, whereas the catch of sockeye

and steelhead peaked at 4.5 million and 4.9 million pounds respectively.

Overfishing was blamed for broad declines in chinook salmon runs by the late 1800s, and by 1900 certain fishing gears were banned to provide some protection to spawning runs. By that time, however, impacts from mining, timber harvest, improper livestock grazing, and agriculture (including irrigation diversions) had begun. Construction of massive mainstream dams and dams on smaller streams followed. During and immediately after World War II, timber harvest and road building rapidly increased. Urbanization pressures, river channelization, pollution, and other impacts from the increasing human population began to become evident by the 1960s, as numerous stocks of all species of salmon, steelhead, and sea-run cutthroat trout declined.

Mainstream dams and hydropower operations currently are cited as dominant factors in the decline of the region's anadromous fisheries. However, many resident salmonids (non-anadromous forms such as bull trout), which are not subject to the migratory pressures exerted on anadromous fish by hydropower operations, are also declining. The bull trout, once widely distributed in central Oregon, Washington, Idaho, and western Montana has been determined by the U.S. Fish and Wildlife Service to warrant protection under the Endangered Species Act. Strong and genetically pure populations of westslope cutthroat trout now occupy only a fraction of their range in the project area. Redband trout within the Columbia Basin are poorly understood, yet many subbasins appear to contain declining populations of genetically unique strains. The significant declines in resident stream salmonid populations are indicative of broad changes in aquatic conditions within the project area. Overall changes in the distribution of salmonid species is portrayed in Maps 2-13 and 2-14.

For this discussion, "strong" watersheds have the following characteristics: (1) all major life-history forms that historically occurred within the watershed are present; (2) numbers are stable or increasing and the local population is likely to be at half or more of its historical size or density; (3) the population or metapopulation within the watershed, or within a larger region of which the watershed is a part, probably contains at least 5,000 individuals or 500 adults.

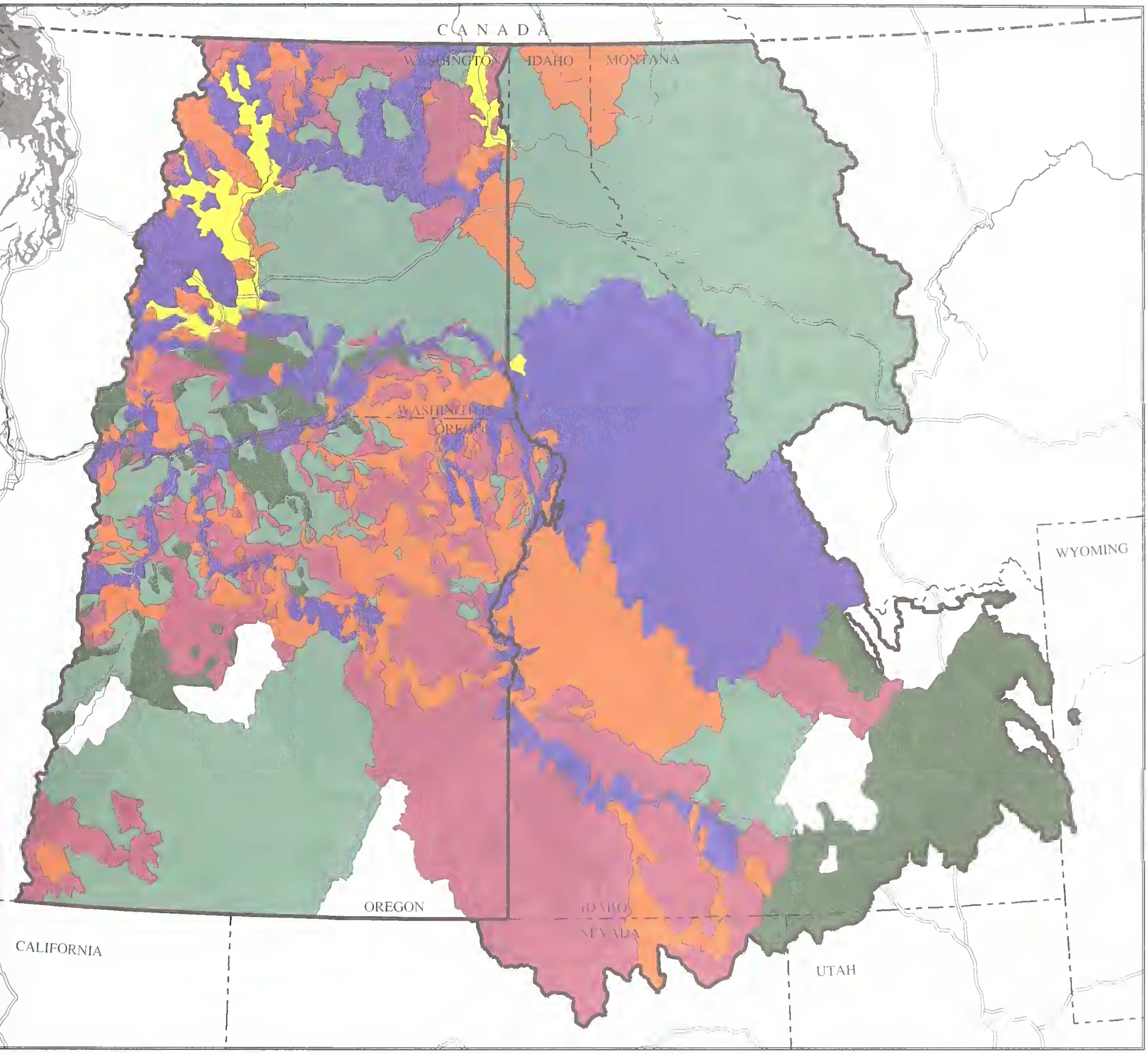
Key Salmonids

Bull trout, westslope cutthroat trout, Yellowstone cutthroat trout, resident redband trout, steelhead, and ocean-type and stream-type chinook are "key salmonids" that were selected by the Science Integration Team (Aquatic STAR 1996) as being *broadly* representative of the state of aquatic biota in the project area. The Scientific Assessment focused on a select group of salmonids for several reasons: (1) This group of fishes has important social and cultural values; (2) knowledge about these fishes is greater than for other species, and thus environmental relationships are likely to be more apparent; (3) these fishes are widely distributed, which allows for broad-scale comparisons; (4) salmonids act as predators, competitors, and prey for a variety of other aquatic and terrestrial species, and are therefore likely to influence the structure and function of aquatic ecosystems, and may serve as links to energy and nutrient flows with terrestrial systems; (5) different salmonid species and life stages often use widely divergent habitats that exposes individual populations to a wide variety of threats, thus integrating cumulative effects of environmental change over broad areas; and (6) the status of these key salmonids can be thought of as a general indicator of aquatic ecosystem health. Problems encountered by these species probably can be assumed to be similar to those facing many aquatic species throughout the project and planning areas.

Bull Trout

Bull trout are recognized as a species of special concern by State management agencies and the American Fisheries Society, and as a sensitive species by the Forest Service and BLM. The U.S. Fish and Wildlife Service considers bull trout a Category 1 Candidate Species under the Endangered Species Act. Bull trout are found in many of the major river systems within the Columbia Basin, but spawning and rearing populations are believed to be primarily restricted to cold and relatively pristine waters, often headwaters of most basins. Current and historical distributions of bull trout are illustrated on map 2-16.

The historical range of bull trout is restricted to North America. Within the project area, bull trout have been recorded in the Klamath River

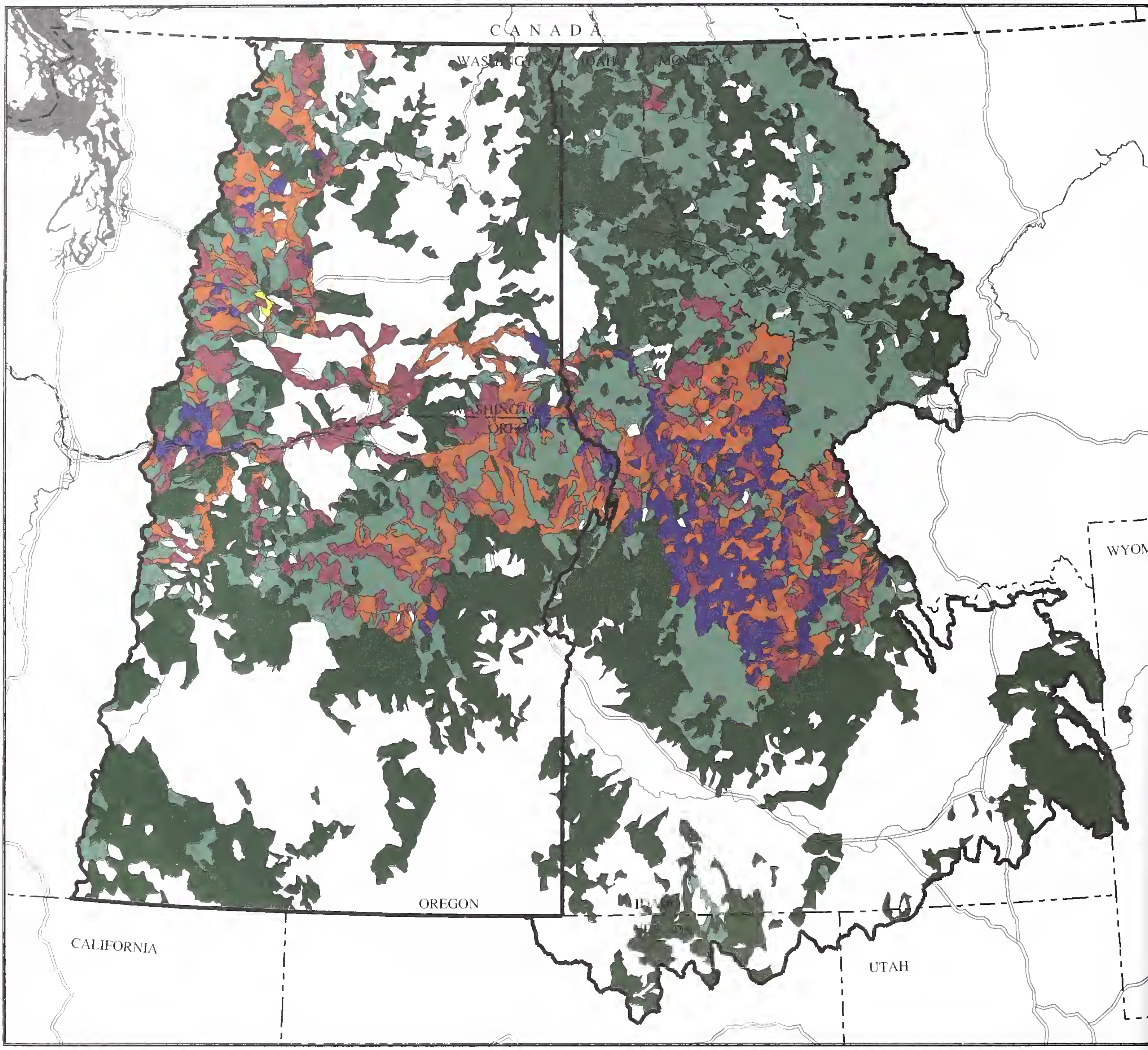


Map 2-13.
Key Salmonids
Historical Distribution

BLM and Forest Service Administered Lands Only

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Project Area
1996



50 0 50 100 150 miles

50 0 50 100 150 km

N

Map 2-14. Key Salmonids Current Distribution

BLM and Forest Service Administered Lands Only

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Project Area
1996

Number of Species:

- One
- Two
- Three
- Four
- Five
- Six

- Major Rivers
- Major Roads
- EIS Area Border

The History of Forest Service/BLM Fish Management

Federally managed lands in the Columbia River Basin contain more than 60 percent of the remaining accessible spawning and rearing habitat for anadromous salmonids. In response to the evidence for declining populations, and the importance of Forest Service- and BLM-administered lands for maintenance and rebuilding of existing populations, these agencies have developed and implemented several strategies intended to maintain and enhance anadromous fish habitat. Another goal of these plans was to meet the goals and objectives of the Northwest Power Planning Council (NWPPC), which was chartered in 1981 to restore a sustainable anadromous fishery within the Columbia River Basin. The Forest Service and BLM have cooperated with the NWPPC, the Bonneville Power Administration (BPA), state fish and game agencies, and tribal governments in an effort to manage anadromous fish habitats.

The Forest Service and BLM have existing Land and Resource Management Plans that were prepared prior to 1990 which address anadromous and resident fish habitat management. These plans are not species or watershed specific. They provide for Forest Service and BLM management to maintain and enhance habitat and to meet existing federal laws such as the Clean Water Act.

In January 1991, the Forest Service developed a Columbia River Basin Anadromous Fish Policy which set forth a consistent plan for management of anadromous fish habitat within the Columbia River Basin. The policy contained a policy implementation guide, which outlined procedures for establishing objectives for anadromous fish production, described desired future conditions, identified habitat inventory needs, and developed monitoring strategies. This policy is still in place, but will be replaced by direction from the Record of Decision developed from this EIS.

The Forest Service and BLM participated in the Hatfield Salmon Summit coordinated by the NWPPC. On May 1, 1991, at the conclusion of the Summit, a Salmon Accord was signed by all of the participants. As a participant in the Accord, the Forest Service was committed to full implementation of the policy implementation guide. The Forest Service and BLM jointly committed to the following: (1) accelerate range management practices to benefit anadromous fish habitat, (2) provide the NWPPC with a listing of private land holdings within Forest Service- and BLM-administered lands that were possibly available for acquisition, (3) provide the NWPPC a listing of all unscreened irrigation diversions and require that when existing permits were renewed, screening would be a condition of the permit, and (4) intensify mineral management administration. Of these commitments, both the Forest Service and BLM were able to provide the NWPPC with a listing of diversions, their screening status, and a listing of lands potentially available for acquisition. Full implementation of the policy implementation guide, and accelerated range and mineral management were not achieved due to funding limitations and new priorities such as development of the Northwest Forest Plan, PACFISH, and Section Seven Consultation for listed sockeye and chinook in the Snake River Basin.

In 1992, the Regional Foresters requested the Chief of the Forest Service assist in the development of a comprehensive anadromous fish strategy for all lands administered by the Forest Service within Forest Service Regions 1, 4, 5, 6, and 10. Before completion of this task, however, Region 10 (Alaska) was withdrawn from this process. In March 1993, The Forest Service and BLM announced their commitment to develop a common strategy for management of Pacific salmon and steelhead habitats (PACFISH). The strategy encompassed approximately 15 million acres of Forest Service- and BLM-administered lands in the Columbia River Basin and 1 million acres of Forest Service- and BLM-administered lands in California.

The development of the Northwest Forest Plan preempted PACFISH in April 1993. The Northwest Forest Plan Draft EIS was published in July 1993, and the Record of Decision was signed April 13. The area covered by PACFISH was greatly reduced, because the Northwest Forest Plan aquatic strategy addressed those Forest Service- or BLM-administered lands within the range of the northern spotted owl, including many watersheds east of the Cascade Range.

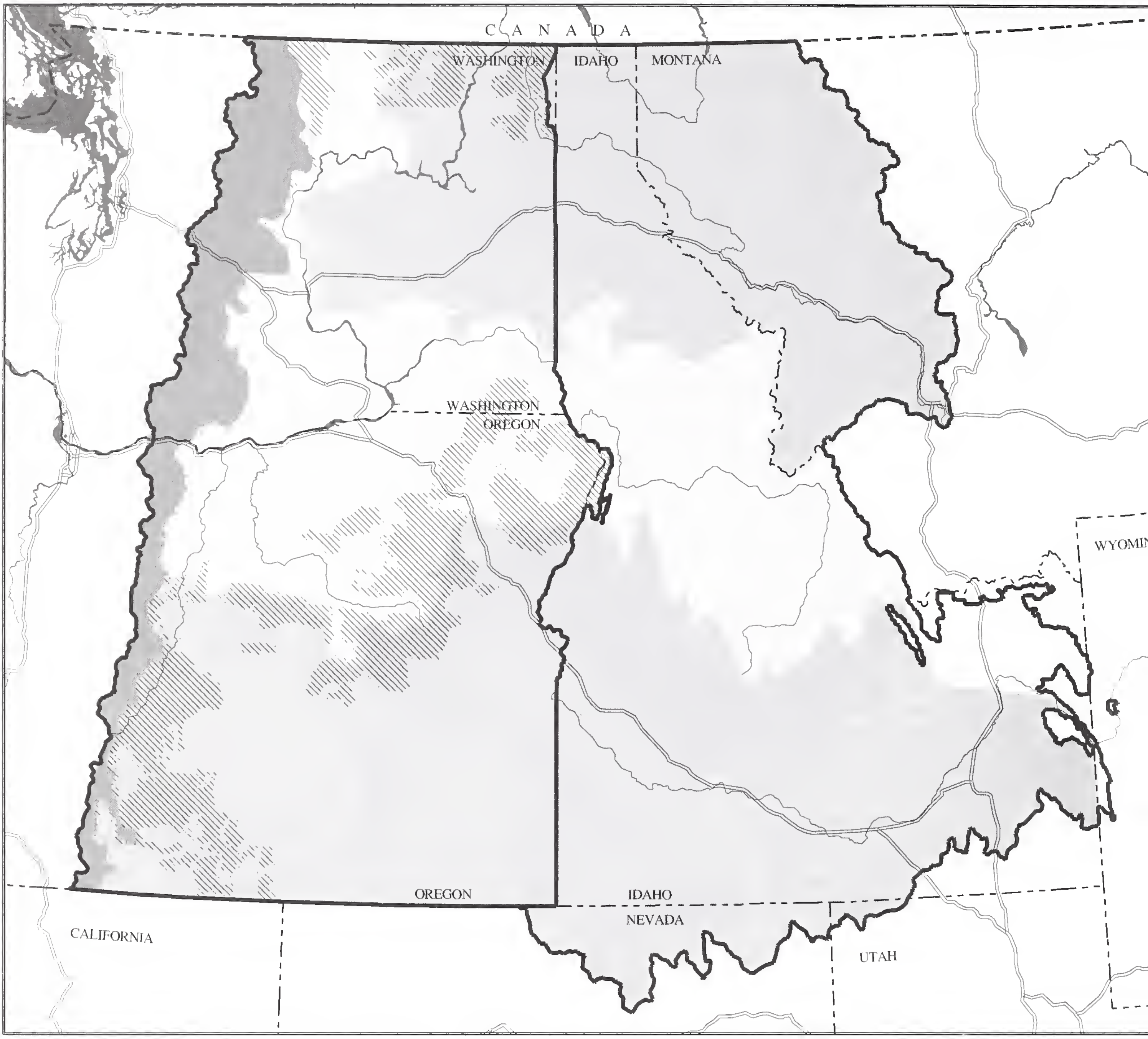
In 1993, the BLM developed their anadromous fish strategy. It remains in place and is being updated in 1996. Their strategy includes all BLM-administered lands supporting anadromous fish.

The PACFISH strategy, a joint document signed by the Chief of the Forest Service and the Director of the BLM in February 1995, outlined and established a strategy for anadromous fish habitat management. PACFISH establishes interim goals and objectives, identified areas that most influence the quality of water and fish habitat, provides special protective standards to guide management activities that may damage those areas, outlines monitoring requirements to track how well agencies follow the standards, and evaluates the effectiveness of these measures.

An inland native fish strategy (INFISH) was developed and implemented in July 1995 by the Forest Service to protect resident fish outside of anadromous fish habitat in eastern Oregon, eastern Washington, Idaho, western Montana, and portions of Nevada. This strategy is similar in content to PACFISH.

Both PACFISH and INFISH are interim for an 18-month period from the date of the Decision Notices until long-term direction is developed through the Eastside and UCRB Environmental Impact Statements.

Map 2-15 illustrates PACFISH, INFISH, policy implementation guide, and Northwest Forest Plan areas.



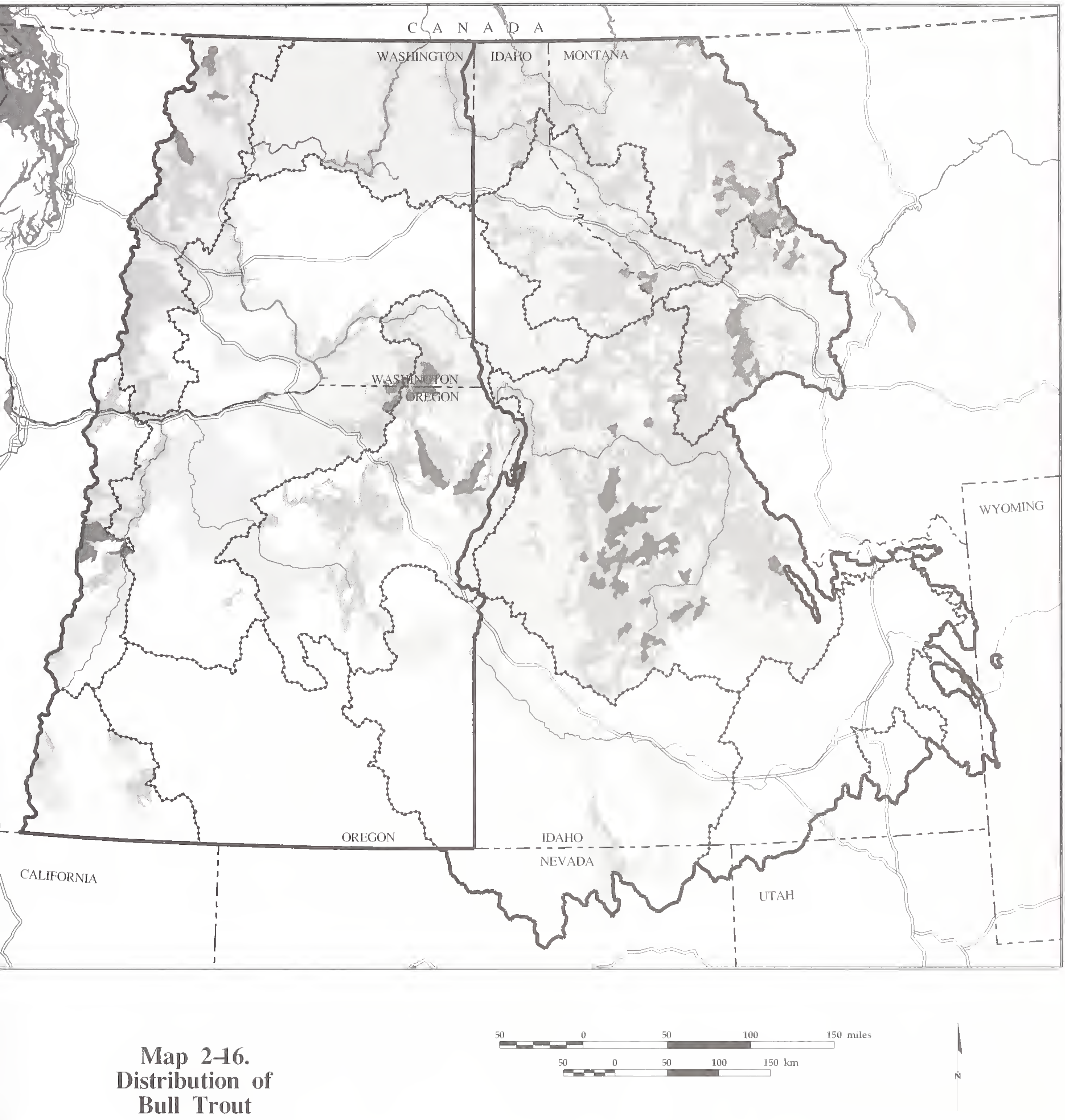
Map 2-15. Interim Management Strategies and Northwest Forest Plan

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Project Area
1996

- Northwest Forest Plan
- Inland Native Fish Strategy*
- PACFISH
- Eastside Screens
- Major Rivers
- Major Roads
- EIS Area Border

*The Inland Native Fish Strategy applies to only those lands administered by the USFS and to bull trout habitat on BLM-administered lands.



**Map 2-16.
Distribution of
Bull Trout**

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996

*Ecological reporting unit names and numbers are found on Map 1-1.

Basin in Oregon, and throughout much of interior Oregon, Washington, Idaho, and western Montana. With the exception of the Little Lost and Big Lost rivers, bull trout are not known in the Snake River basin above Shoshone Falls. It is estimated that the historical range of bull trout included about 60 percent of the project area. It is unlikely, however, that bull trout occupied all accessible streams at any one time due to climate and habitat selection.

Bull trout are presently known or estimated to occur in 44 percent of historically occupied watersheds. Bull trout are still widely distributed throughout the project area, with the largest population blocks in north central Idaho and northwestern Montana. A small population still exists in the headwaters of the Jarbidge River, Nevada, which represents the present southern limits of the species range. Current information indicates that despite its relatively broad distribution, this species has experienced widespread decline. There is evidence of declining trends in some populations, and recent extinctions of local populations have been reported. Distribution of existing populations is often patchy, even where numbers are still strong and habitat is good.

Spawning and rearing of bull trout appears to be limited to the coldest streams or stream reaches. The lower limits of habitat used by bull trout are strongly associated with gradients in elevation, longitude, and latitude that may approximate a gradient in climate across the project area. The patterns indicate that variation in climate has influenced and will strongly influence habitat available for bull trout. While temperatures are probably suitable throughout much of the northern portion of the range, spawning and rearing habitat is restricted to increasingly isolated high elevation or headwater "islands" toward the south.

Management-related changes influencing stream temperatures and hydrologic regimes are all likely to be important to some, if not most, populations. Populations are likely to be most sensitive to changes in headwater areas encompassing critical spawning and rearing habitat and remnant populations.

More than 30 non-native species occupy the present distribution of bull trout. Brown trout, brook trout, and lake trout have probably depressed or replaced many local bull trout populations. Brook trout are an especially important competitor and may progressively displace bull trout through hybridization and a higher reproductive potential. Brook trout now occupy the majority of watersheds representing the current range of bull trout. These non-native fish may pose the most risk to native species at sites where habitat has been affected by other disturbances.

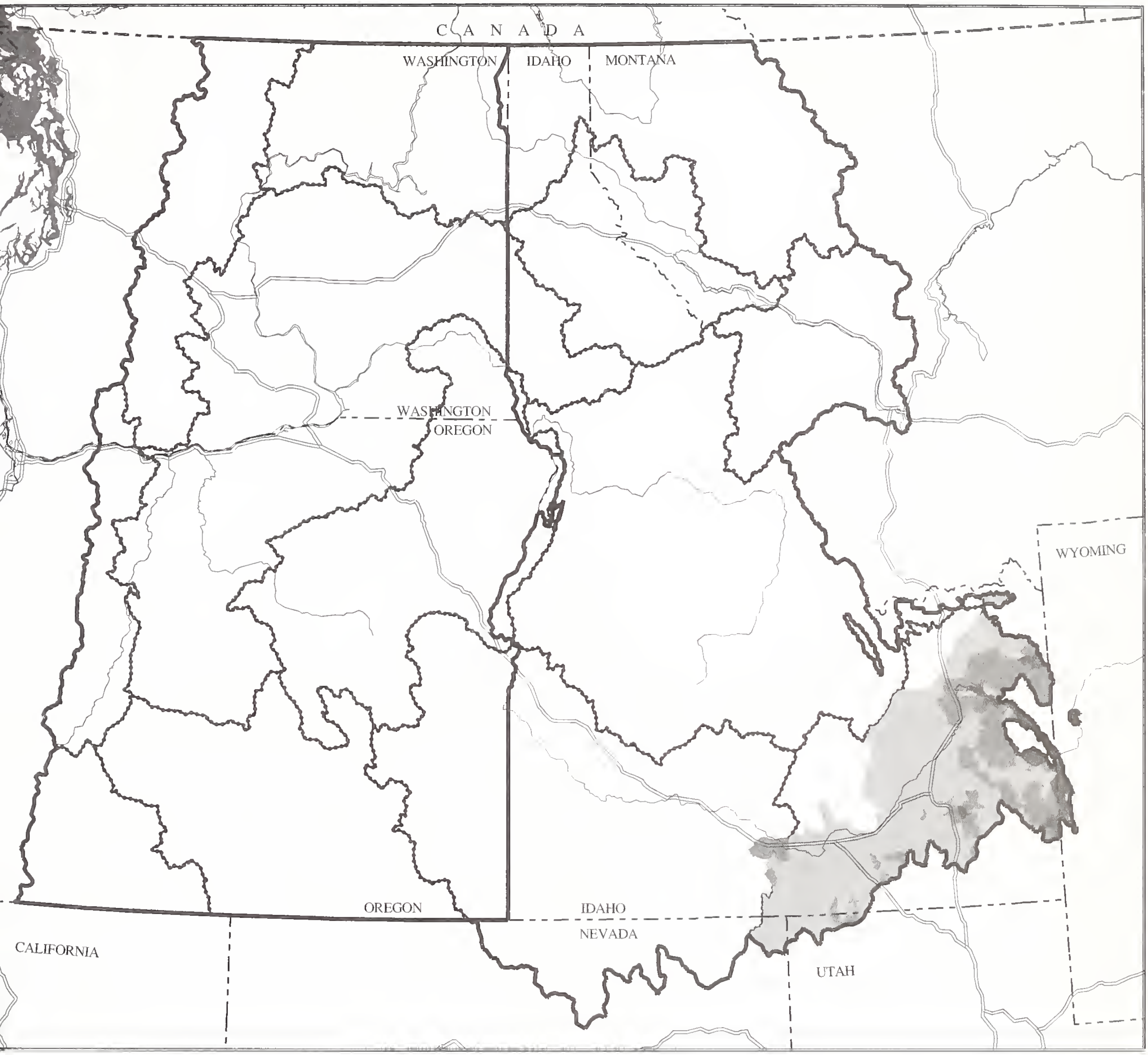
Historically, bull trout populations were well connected throughout the Columbia River Basin. Habitat available to bull trout has been fragmented, and in many cases, entirely isolated. Dams have isolated whole subbasins throughout the project area. Irrigation diversions, culverts, and degraded mainstem habitats have eliminated or seriously affected migratory corridors, thus depressing migratory populations and effectively isolating remnant populations in headwater tributaries. Loss of suitable habitat through watershed disturbance may also increase the distance between quality habitats and between strong populations, thus reducing the likelihood of effective dispersal and gene mixing. Further isolation of populations will probably lead to increasing rates of extinction that are disproportional to the simple loss of habitat area.

Summary by ERU:

The core of the remaining bull trout distribution is tied to the Central Idaho Mountains (ERU 13), with important strongholds still evident or likely within the Upper Clark Fork (ERU 8), Northern Glaciated Mountains (ERU 7), Lower Clark Fork (ERU 9), and Blue Mountains (ERU 6). Bull trout in the Owyhee Uplands (ERU 10) represent an important area of genetic diversity.

Yellowstone Cutthroat Trout

The Yellowstone cutthroat trout is more abundant and inhabits a larger geographical range than any other non-anadromous subspecies of cutthroat trout. Individual populations of Yellowstone cutthroat trout have evolved numerous life-history characteristics in response to the diverse environments in which they have been isolated since the Pleistocene ice age. There has recently been a substantial reduction in the distribution of this subspecies, and many unique local populations have been lost. As a result, the Yellowstone cutthroat

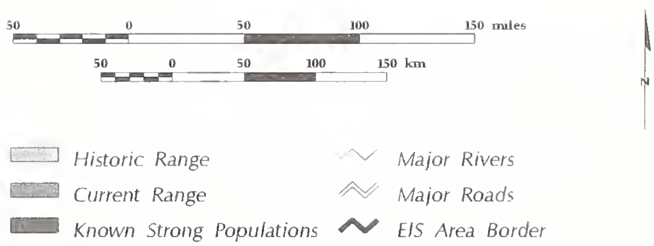


Map 2-17. Distribution of Yellowstone Cutthroat Trout

BLM and Forest Service Administered Lands Only

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Project Area
1996



*Ecological reporting unit names and numbers are found on Map 1-1.

trout has been designated as a "Species of Special Concern - Class A" by the American Fisheries Society. This status has been officially recognized by the Montana Department of Fish, Wildlife, and Parks, and the Yellowstone cutthroat trout is recognized as a "Species of Special Concern" in Idaho. Both the Northern and Rocky Mountain Regions of the Forest Service and BLM consider the Yellowstone cutthroat trout a sensitive species. Current and historical distributions of Yellowstone cutthroat trout are illustrated on map 2-17.

Yellowstone cutthroat trout were historically found throughout the Yellowstone River drainage in Montana and Wyoming and in the Snake River drainage in Wyoming, Idaho, Utah, Nevada, and probably Washington. It is the only native trout in the Snake River above Shoshone Falls. Its historical range included primarily the Upper Snake (ERU 11) and Snake Headwaters (ERU 12) where 74 percent and 98 percent, respectively, of the watersheds once supported Yellowstone cutthroat trout.

Within the project area, Yellowstone cutthroat trout are presently the most narrowly distributed of the key salmonids. The current known and estimated distribution includes 70 percent of its historical range. Human activities such as introduction of non-native fishes, habitat degradation, and angler harvest have resulted in loss of populations of this subspecies. Losses have been particularly widespread in the Upper Snake (ERU 11). Large-river populations, in particular, have declined or disappeared. To promote fishing opportunities and to counter declines in natural distributions of Yellowstone cutthroat trout, stocking activities by agencies and private individuals have expanded the species range, particularly in mountain lakes throughout Idaho and Montana. Introductions of Yellowstone cutthroat trout outside their historical range have established them in 158 additional watersheds, accounting for 30 percent of the present range.

Despite their narrow distribution, Yellowstone cutthroat trout are judged to support the largest proportion of strong populations of any key salmonid. These estimates of strong populations may be misleading because of high probability of hybridization in most populations. Hybridization resulting from introductions of rainbow trout and non-native subspecies or populations of cutthroat trout is the primary cause of the decline and extirpation of Yellowstone cutthroat trout. Genetically unaltered populations of Yellowstone cutthroat trout occur in approximately 10 percent of their historical stream habitats and approximately 85 percent of their historical lake habitats. Approximately 90 percent of the present range of genetically unaltered Yellowstone cutthroat trout is within Yellowstone National Park.

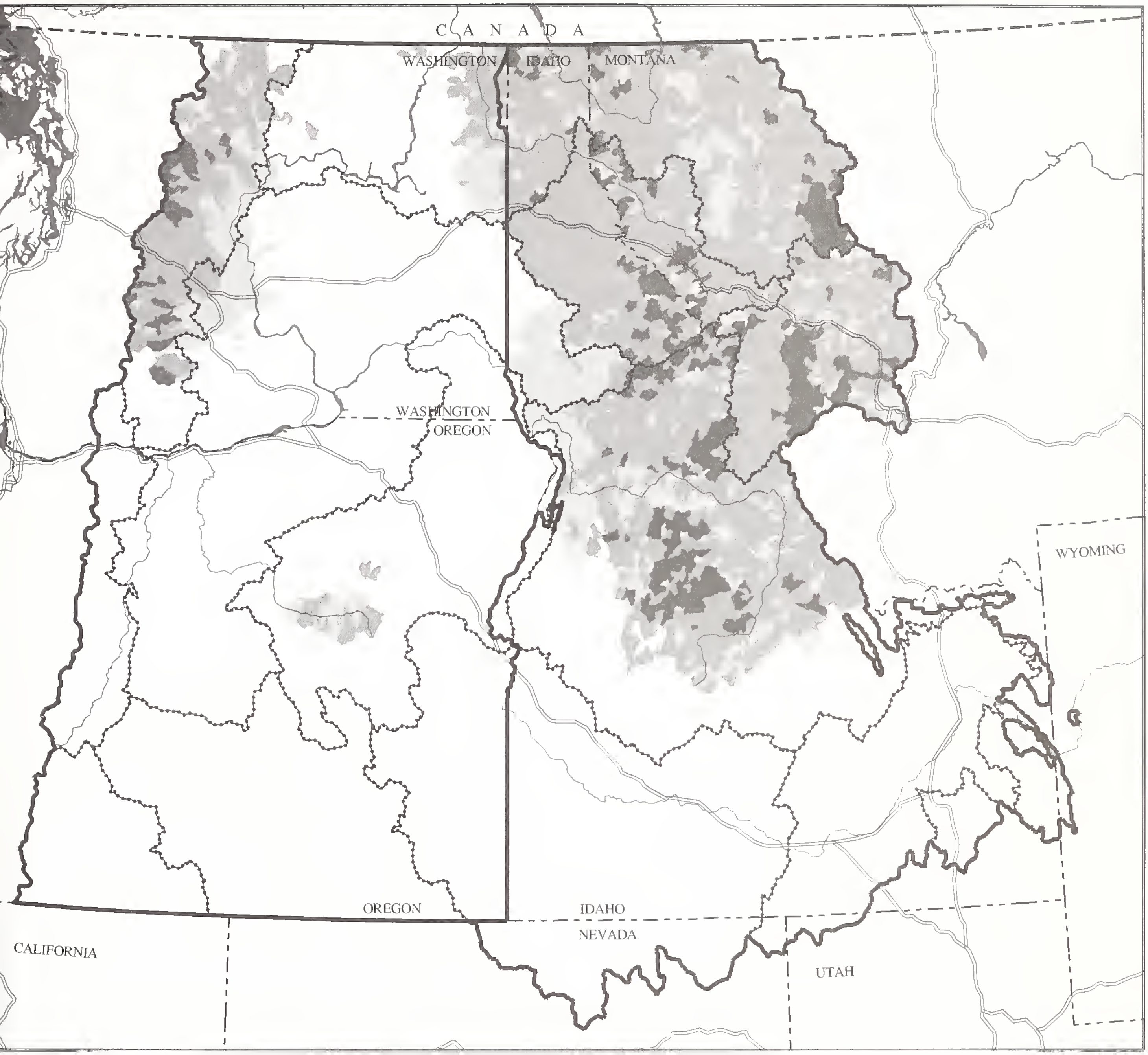
Human activities such as dam construction, water diversions, improper livestock grazing, mineral extraction, road construction, and timber harvest have degraded stream environments throughout the historical range of Yellowstone cutthroat trout. Recreational use can also be a source of disturbance. In the range of this species, improper livestock grazing on private and public lands in the upper Snake River Basin has caused degradation of riparian areas, including stream bank erosion and channel instability.

Summary by ERU:

> *The range of genetically unaltered populations of Yellowstone cutthroat trout has been reduced. The core of remaining populations is in the Snake Headwaters (ERU 12). Populations are widespread in the Upper Snake (ERU 11), but most are depressed. Remaining populations on the western edge of the range appear to be isolated in small areas. Population declines and losses have been most common in low elevation, higher order streams, as illustrated by the current distribution and status of Yellowstone cutthroat trout in the Upper Snake (ERU 11). Remoteness of portions of the native range probably contributes to the preservation of remaining populations. Many of these publicly owned portions of the native range, in the form of parks and reserves, have provided habitat protection that is lacking in low elevation portions of the range.*

Westslope Cutthroat Trout

Westslope cutthroat trout were once abundant throughout much of the north and central interior Columbia Basin. Although still widely distributed, remaining populations may be seriously compromised by habitat loss and



50 0 50 100 150 miles

50 0 50 100 150 km

N

Map 2-18. Distribution of Westslope Cutthroat Trout

- Historical Range
- Current Range
- Known Strong Populations
- Major Rivers
- Major Roads
- EIS Area Border
- Ecological Reporting Unit Border*

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Project Area
1996

*Ecological reporting unit names and numbers are found on Map 1-1.

hybridization. The U.S. Fish and Wildlife Service currently lists the westslope cutthroat trout as a Category 2 species. They are presently considered a sensitive species by the Forest Service and BLM, and of special concern by State management agencies in Washington, Oregon, Idaho, and Montana. Current and historical distribution of westslope cutthroat trout are illustrated on map 2-18.

Westslope cutthroat trout had the largest historical distribution of all subspecies of cutthroat trout. Cutthroat trout were first recorded by the Lewis and Clark expedition. From early explorer accounts, it is believed they were extremely abundant. Where habitat is suitable and watersheds are accessible, westslope cutthroat trout are commonly found. Westslope cutthroat trout probably also occupied most of the large natural lakes within the range. The historical range of westslope cutthroat trout encompassed about 35 percent of the project area.

Westslope cutthroat trout are still widely distributed within their historical range, with some extension through hatchery introductions. It is estimated that westslope cutthroat trout are still present in at least 85 percent of their historical range. This broad distribution suggests that, overall, westslope cutthroat trout are secure, but this conclusion must be tempered by uncertainty regarding the genetic integrity of remaining populations. Most current wild populations are depressed, and hybridization, fragmentation, and the loss of migratory populations have limited healthy populations to a much smaller proportion of their historical range.

Cutthroat trout and rainbow trout are closely related, but they have remained reproductively distinct where they co-evolved. Where non-native rainbow trout have been introduced, hybridization is widespread. Yellowstone cutthroat have also been introduced into much of the westslope cutthroat trout range, and hybridization is common between these two species. Hybridization was believed to be the most important cause for decline of westslope cutthroat trout populations in Montana.

Westslope cutthroat trout are also a prized game fish, and fishing has probably led to the elimination of some small populations, especially migratory fish in some river systems. Consequently, special harvest restrictions have been implemented to improve or maintain most westslope cutthroat trout populations.

Construction of dams, irrigation diversions, or other migration barriers have isolated or eliminated westslope cutthroat trout habitats that were once available to migratory populations. Resident forms may persist in isolated segments of streams, but the potential for long-term persistence is compromised by the loss of migratory life-history and lack of connectivity with other populations potentially important to gene flow or population dynamics.

Most existing strong populations are largely in roadless and Wilderness Areas or National Parks, suggesting that human disturbances have influenced distribution and abundance. In general, strong populations are thought to be primarily associated with areas of limited human influence and the associated potential effects of fishing, watershed disturbance, and non-native fish introductions.

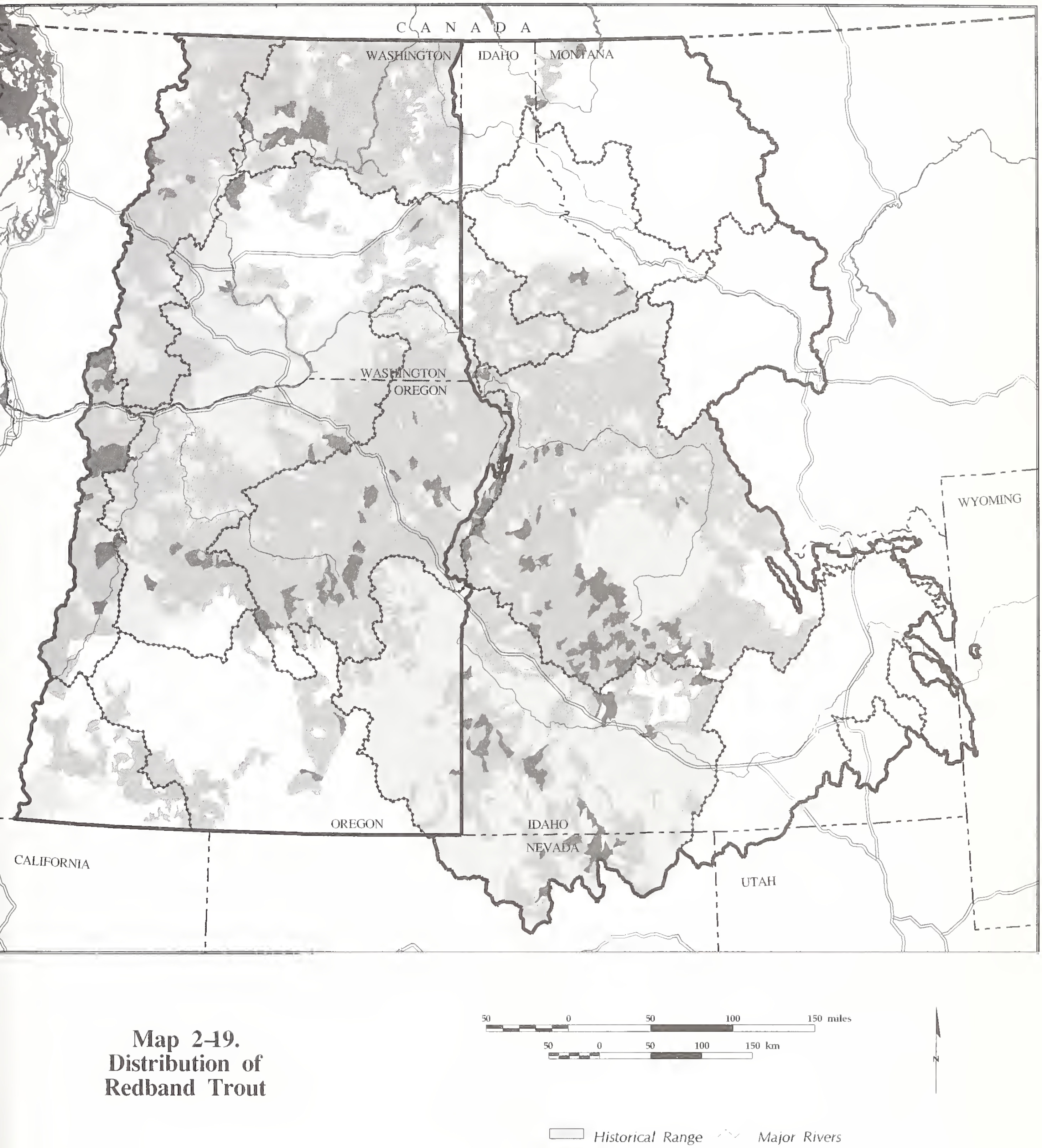
Summary by ERU:

The core of the distribution for strong populations is clearly associated with the Central Idaho Mountains (ERU 13), and many populations there do appear secure. Other important blocks of known or likely habitat are in the Upper Clark Fork (ERU 8) and Northern Glaciated Mountains (ERU 7). Persistence of westslope cutthroat trout in those areas also appears likely, although these areas are also more fragmented and restricted to a relatively small portion of the historical distribution.

Redband Trout ("Resident" and "Resident-Interior")

The redband trout (native rainbow trout) is a widely distributed western North America native salmonid. Of the key salmonids, redband trout originally had the widest distribution, occupying 73 percent of the watersheds within the project area. The only major portions of the project area that historically did not support redbands were the Snake River upstream from Shoshone Falls, tributaries to the Spokane River above Spokane Falls, and portions of the northern Great Basin in Oregon.

Redband trout within the project area have two distinct life histories, anadromous (steelhead)



Map 2-19. Distribution of Redband Trout

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Project Area
1996

*Ecological reporting unit names and numbers are found on Map 1-1.

or non-anadromous (freshwater resident). For purposes of the Scientific Assessment (1996), freshwater resident redbands were further divided into "resident-interior" (native non-anadromous redband trout outside the range of the steelhead) and "resident"(those populations that exist within the range of steelhead). Current and historical distributions of Redband Trout are illustrated on map 2-19.

Resident and resident-interior redband trout are considered species of special concern by the American Fisheries Society and all States within the historical range, and are classified as sensitive species by the Forest Service and BLM. The U. S. Fish and Wildlife Service lists redbands as a Category 2 species. In 1994, the Kootenai River redband stock in northern Idaho and Montana was petitioned for listing under the Endangered Species Act.

Collectively, resident and resident-interior redband trout currently may be the most widely distributed key salmonid in the project area. Resident redbands are the more widely distributed of the two forms; the known and estimated distribution includes 69 percent of the historical range. The largest areas of unoccupied historical habitat are in the Owyhee Uplands (ERU 10) and Columbia Plateau (ERU 5). Resident-interior redbands are not as widely distributed and are currently found or anticipated in 50 percent of the identified historical range.

Despite their broad distribution, less is known about the current distribution of redband trout than any of the other key salmonids. One reason for the lack of information is the inability to differentiate juvenile steelhead and resident redbands. Therefore the status of resident redbands was considered "unknown" when steelhead were present in a watershed. The known and estimated distribution of both forms of redbands includes 65 percent of the historical range. However, the distribution and status of native redband trout may be more depressed than the above estimates indicate because of hybridization with stocked rainbow trout. Preliminary status reviews in Idaho, Oregon, and Montana generally support this concern.

Despite their broad distribution, relatively few strong resident redband populations exist. Known or predicted strong areas included 17 percent of the historical range and 24 percent of the present range. Only 30 percent of the watersheds supporting spawning and rearing populations were classified as having strong populations. The core distribution of resident redbands appears to be in the Northern Cascades (ERU 1), Blue Mountains (ERU 6), and Central Idaho Mountains (ERU 13). There are also known or suspected populations within the Owyhee Uplands (ERU 10) and Northern Glaciated Mountains (ERU 7), where steelhead have been isolated recently by dams. These populations appear to be far more fragmented and probably less secure than populations within the core. Because these latter populations are within the fringe of the range of redbands historically associated with steelhead, these populations may represent important sources of genetic diversity.

Resident-interior redband trout occupy parts of the Northern Great Basin (ERU 4), Northern Glaciated Mountains (ERU 7), Columbia Plateau (ERU 5), Central Idaho Mountains (ERU 13), and Owyhee Uplands (ERU 10). Remaining populations appear to be severely fragmented and restricted to small blocks of habitat. Resident-interior redband trout have few remaining strong populations; current strong populations encompass 10 percent of their historical range and 20 percent of their present range. Resident-interior redband populations appear to have declined most in the Northern Great Basin (ERU 4) and Columbia Plateau (ERU 5), where 72 percent of their historical range is presently unoccupied and there are few remaining strong populations.

Interior redband habitats have been altered by a variety of land-use practices. Reduction in streamflow because of water diversion for irrigation threatens many populations in the southern portion of the range. Increased water temperature has also been a factor, especially in drier and warmer areas. Temperature increases are largely due to loss or conversion of riparian vegetation resulting from grazing, timber harvest, urbanization, and agriculture.

Channel alterations associated with flood-control projects, floodplain development, and road construction have been extensive within the range of redbands. Channel alterations affect stream hydraulics, nutrient pathways, invertebrate production, and fish production. In Idaho, unaltered stream reaches supported eight to ten times the densities of redband trout observed in altered channels. Redband trout appear to have evolved over a broader

range of environmental conditions than the other key salmonids, and appear to have less specific habitat requirements. Their apparent persistence even in some heavily disturbed basins suggests they are more resilient than other species. Therefore, the loss of a redband population could be a strong indication of disruption in the aquatic ecosystem processes.

Summary By ERU:

Resident redbands are or are predicted to be widely distributed in large blocks of suitable habitat in the Northern Cascades (ERU 1), Blue Mountains (ERU 6), and Central Idaho Mountains (ERU 13). These watersheds represent the core of the distribution associated with or derived from steelhead and appear to be relatively secure, although hybridization with introduced rainbow trout is a potentially serious, but unevaluated threat. Populations in watersheds within the Owyhee Uplands (ERU 10) and Northern Glaciated Mountains (ERU 7) were isolated from steelhead in recent history by dams. These latter populations appear to be far more fragmented and probably less secure. Resident-interior redband trout within portions of the Northern Glaciated Mountains (ERU 7), Northern Great Basin (ERU 4), Columbia Plateau (ERU 5), Central Idaho Mountains (ERU 13), and Owyhee Uplands (ERU 10) have been isolated from steelhead over geologic time. Remaining populations appear to be severely fragmented and restricted to small blocks of known or potential habitat. These areas likely represent a critical element of the evolutionary history for this species.

Steelhead

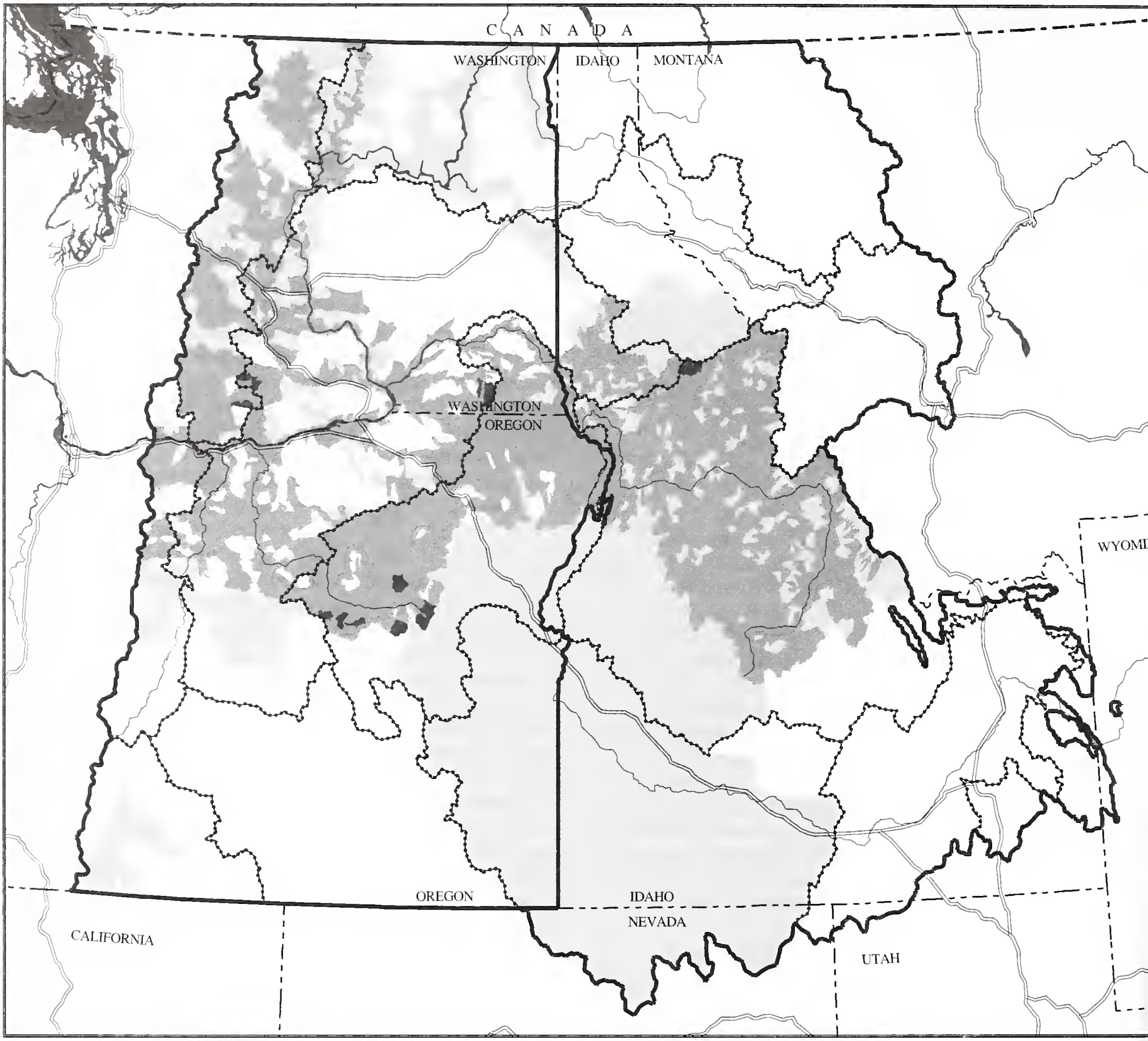
Steelhead, the anadromous form of redband trout found within the project area, are distributed within the interior Columbia River Basin as two major forms, winter and summer, although interior steelhead are primarily summer-run. Winter-run steelhead enter freshwater three to four months prior to spawning, and summer-run steelhead enter freshwater nine to ten months prior to spawning.

The distribution and abundance of steelhead have declined from historical levels as a result of mortality at and between dams, habitat degradation, loss of access to historical habitat, overharvest, and interactions with hatchery-reared and exotic fishes. Most of the current populations are hatchery-reared. Numerous State and Federal management agencies list remaining wild steelhead populations as species of special concern. The American Fisheries Society considers all stocks of winter steelhead upstream from Bonneville Dam to be at high or moderate risk of extinction, and most summer steelhead stocks are considered to be at moderate risk of extinction or of special concern. Concern for the persistence of steelhead stocks resulted in 1994 petitions to the National Marine Fisheries Service for review of the species status under the Endangered Species Act. Steelhead represent a key species because of their broad distribution, value as a sport and commercial fish, and importance as a tribal ceremonial and subsistence resource. Current and historical distributions of steelhead are illustrated on Map 2-20.

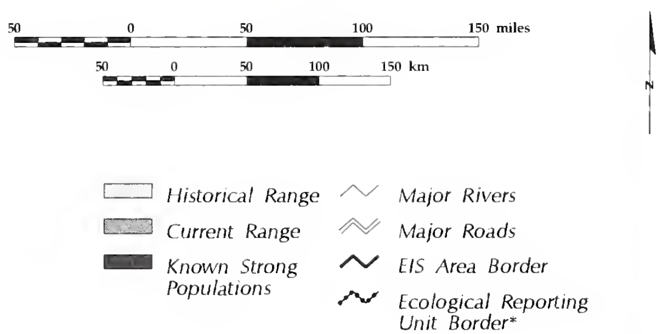
The historical range of steelhead includes all freshwater west of the Rocky Mountains with access to the Pacific Ocean, extending from northwest Mexico to the Alaska Peninsula. Within the project area, steelhead were present in most streams, including many intermittent streams, that were accessible to anadromous fish, including all accessible tributaries to the Snake River downstream from Shoshone and Spokane Falls and accessible tributaries to the Columbia River. In total, approximately 10,523 miles of stream were accessible to steelhead in the Columbia River basin including Canada, although it is unlikely that steelhead occupied all reaches of all accessible streams because water temperature factors may have restricted distribution. Steelhead formerly ascended the Snake River and spawned in reaches of Salmon Falls Creek, Nevada, more than 900 miles from the ocean. Steelhead occupied about 50 percent of the watersheds in the project area.

Historical steelhead runs were large. It is reported that the commercial steelhead catch peaked in the late 1890s at 4.9 million pounds. Initial estimates of run sizes were derived after Bonneville Dam was constructed in 1938. In 1940, 423,000 summer steelhead passed the dam. Annual sport harvests averaged 117,000 summer-run and 62,000 winter-run fish from 1962 to 1966.

Steelhead are still the most widely distributed anadromous salmonid in the project area; however, steelhead are extirpated from large portions of their historical range. Presently occupied watersheds encompass approximately



Map 2-20. Distribution of Steelhead Trout



INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996

*Ecological reporting unit names and numbers are found on Map 1-1.

45 percent of the watersheds historically occupied. Steelhead are extinct in the Lower Clark Fork and Owyhee Uplands. Within the Columbia River Basin in the United States and Canada, about 75 percent of the stream mileage within their historical range is no longer accessible. Within their current distribution, few healthy wild steelhead populations exist. Watersheds known or estimated to support strong spawning and rearing populations of wild steelhead represent 0.6 percent of the historical range and 1.3 percent of the current range. Some 98 percent of the watersheds where steelhead spawn and rear are classified as containing depressed populations of wild steelhead.

Existing steelhead populations are composed of four main types: wild, natural (non-native progeny spawning naturally), hatchery, and mixes of natural and hatchery fish. Production of wild anadromous fish in the Columbia River Basin has declined by about 95 percent from historical levels. Most existing steelhead production is supported by hatchery and natural fish as a result of large-scale hatchery mitigation production programs. By the late 1960s, hatchery production surpassed wild production in the Columbia River Basin. Wild fish, unaltered by hatchery stocks, are rare and are present in only 10 percent of the historical range and 25 percent of the current distribution. Remaining wild stocks are concentrated in reaches of the Salmon River in Central Idaho and the John Day River Basin in Oregon.

Construction and operation of mainstem dams on the Columbia and Snake Rivers is considered a major cause of decline of steelhead. Hydroelectric development changed Columbia and Snake River migration routes from mostly free-flowing in 1938 to a series of impoundments by 1975, and reservoir storage activities have reduced flows in most years during smolt migration. Steelhead must navigate past as many as eight mainstem dams. Adults are delayed during upstream migrations, and smolts may be killed by turbines; become disoriented or injured, making them more susceptible to predation; or become delayed in the large impoundments behind dams. Smolt-to-adult return rates declined from approximately 4 percent in 1968 to less than 1.5 percent from 1970 to 1974. In 1973 and 1977, low flows resulted in 95 percent mortality of migrating smolts. Map 2-21 illustrates the locations of mainstem dams on the Columbia River System.

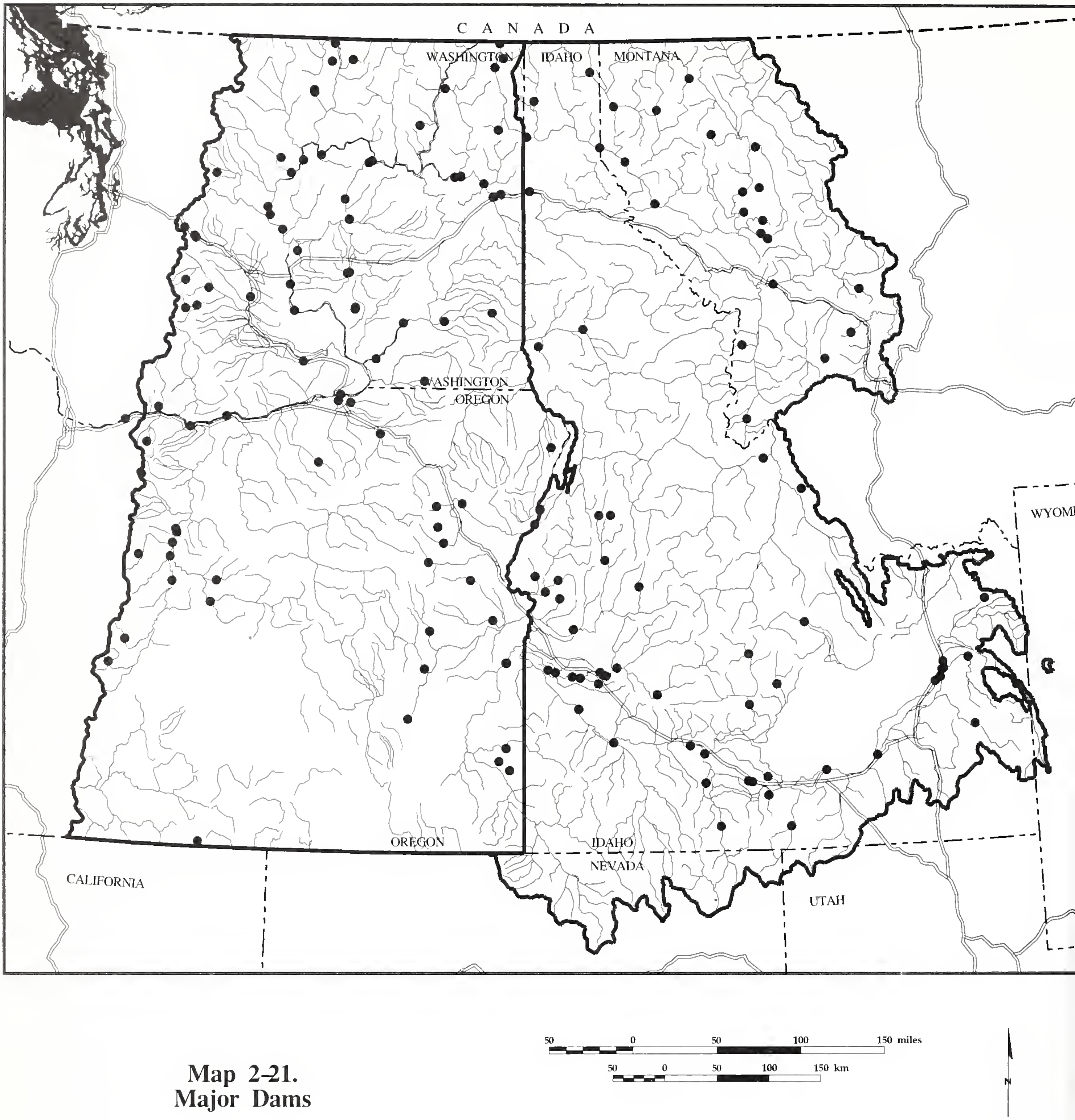
Non-native fish and hatchery operations have also affected wild steelhead populations. Hatcheries have been widely used in attempts to mitigate losses of steelhead caused by construction and operation of dams. Hatchery operations affect wild steelhead populations through genetic hybridization and loss of fitness, creation of mixed-stock fisheries, competition for food and space, and increased diseases. Introduced rainbow trout also have the potential to mature and hybridize with steelhead, and this species has been introduced throughout the current steelhead range. Supplementation of native stocks with hatchery fish have typically resulted in replacement, not enhancement, of native steelhead.

Biotic factors including predation and competition also may influence the abundance of steelhead. More than 55 exotic fish species have been introduced within the current range of steelhead. Because exotic fish species did not co-evolve with steelhead, there has been no opportunity for natural selection to lessen competition or predation. Dams have created habitat that is suitable for a variety of native (northern squawfish) and non-native predators and potential competitors. The abundance and distribution of native predators may also be influenced by human habitat alterations.

More than 95 percent of the healthy native stocks of anadromous fish are believed to be threatened by some degree of habitat degradation. Fish habitat quality in most watersheds has declined. As described in previous sections, pool frequency has decreased and fine sediment has increased in many project-area watersheds. In addition to hydroelectric development, most alterations of steelhead habitat can be attributed to human land-disturbing activities as a result of mining, timber harvest, agriculture, industrial development, and urbanization.

Summary by ERU:

Steelhead are still relatively widely distributed in the project area, but they are extirpated in nearly 60 percent of the historical range. Although steelhead are widespread throughout the remaining accessible range, most populations are depressed and influenced by hatchery supplementation. Wild stocks are rare; core areas for remaining wild populations include the Salmon and John Day river basins. The



Map 2-21.
Major Dams

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

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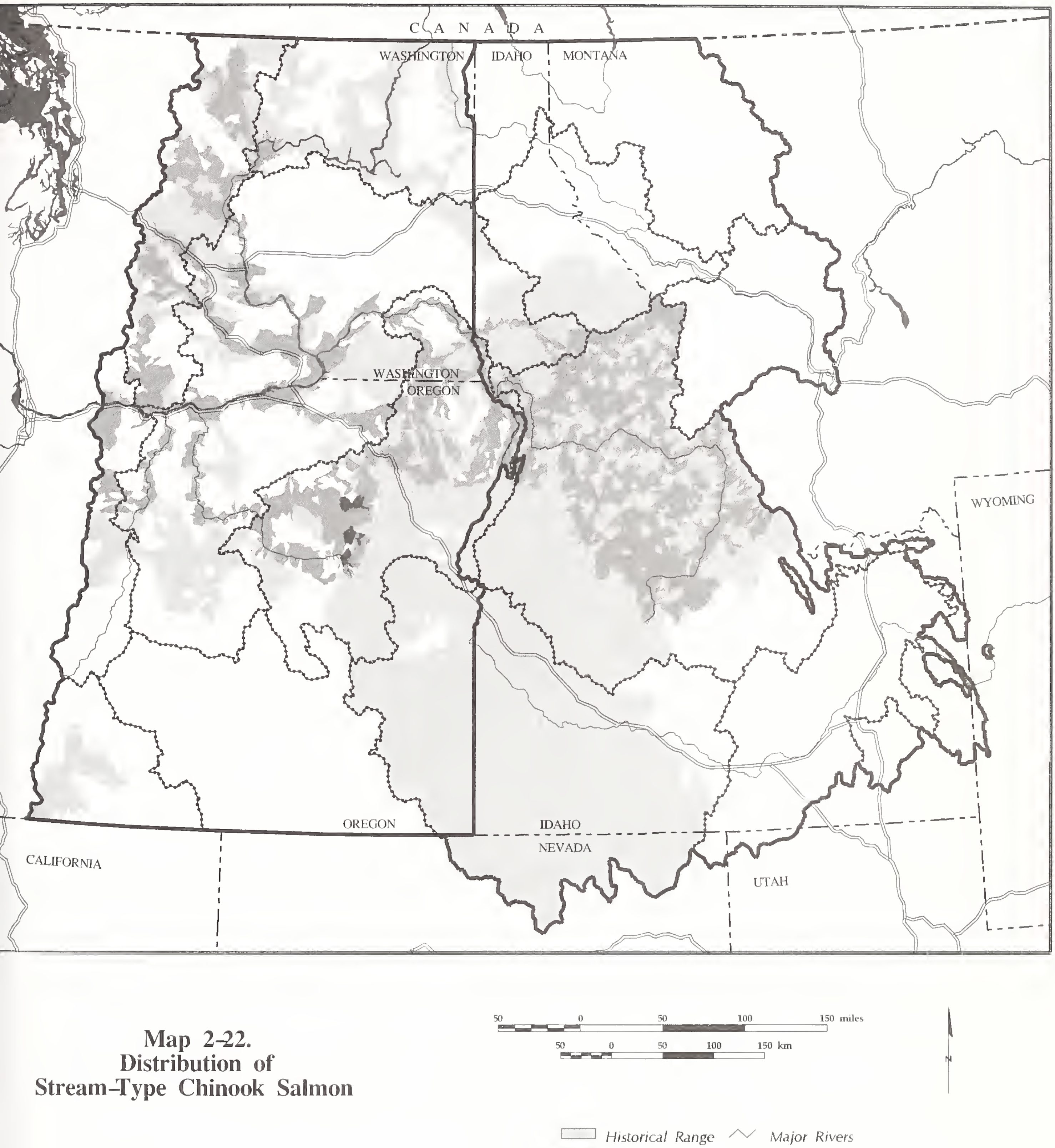
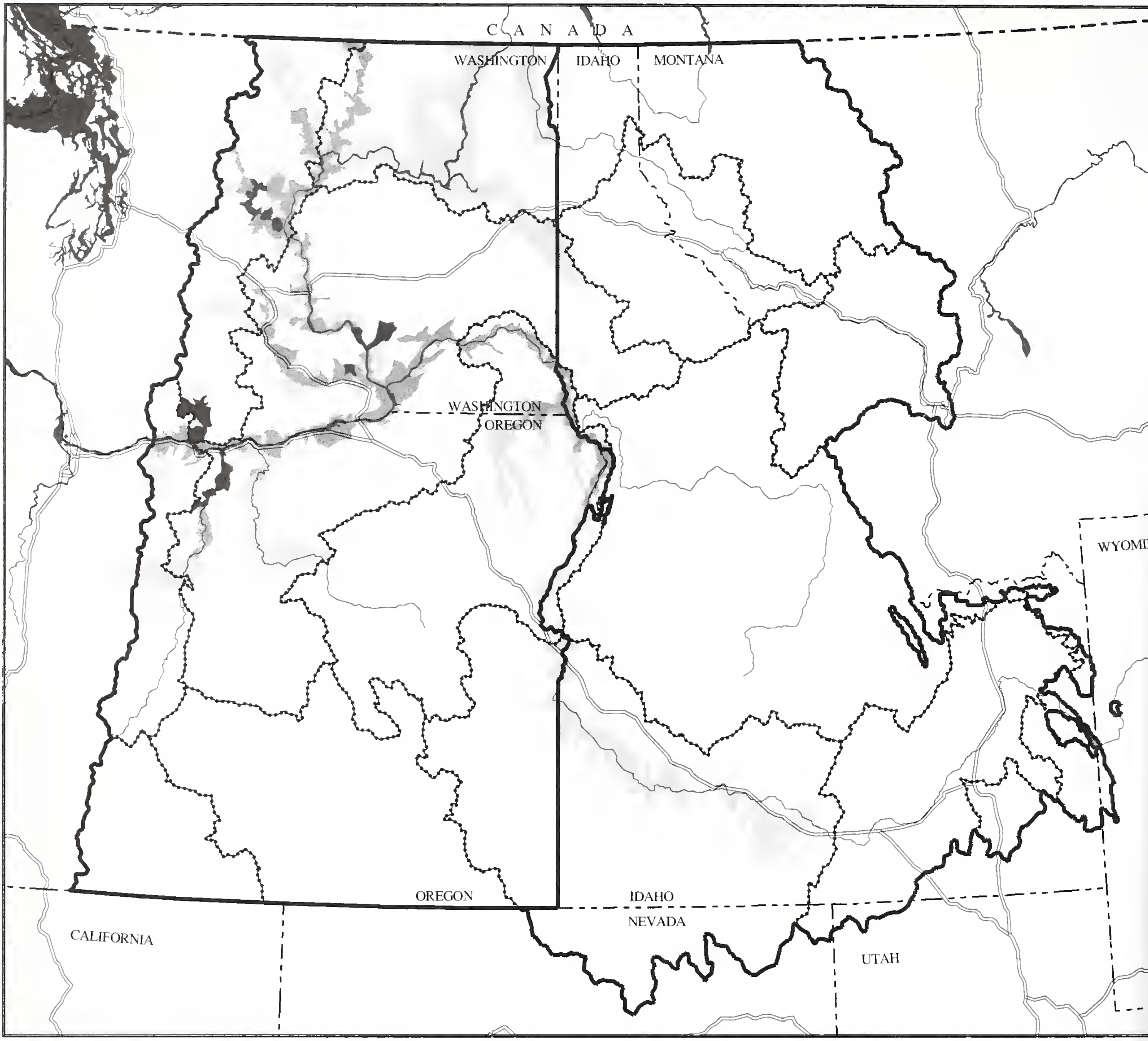


Map 2-22. Distribution of Stream-Type Chinook Salmon

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Project Area
1996

*Ecological reporting unit names and numbers are found on Map 1-1.



Map 2-23. Distribution of Ocean-Type Chinook Salmon

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Project Area
1996

50 0 50 100 150 miles

50 0 50 100 150 km

N

- Historical Range
- Current Range
- Known Strong Populations
- Major Rivers
- Major Roads
- EIS Area Border
- Ecological Reporting Unit Border*

*Ecological reporting unit names and numbers are found on Map 1-1.

only remaining strong populations are found among wild stocks, primarily in the Columbia Plateau and Blue Mountains (ERU 6). Within the Central Idaho Mountains (ERU 13), recent steelhead runs have been critically low.

Chinook Salmon

The salmon problem is addressed in the National Research Council report *Upstream* (NRC 1996) as "the decline of wild salmon runs and the reductions in abundance of salmon even after massive investments in hatcheries. The declines ~ largely a result of human impacts on the environment caused by activities such as forestry, agriculture, grazing, industrial activities, urbanization, dams, hatcheries, and fishing ~ are widespread, although not universal." Chinook salmon in the project area are traditionally described as spring, summer, and fall runs, distinguished primarily by their time of passage over Bonneville Dam. These names have led to some confusion because stocks of similar run timing may differ considerably between the Snake and Columbia rivers in their spawning areas, life histories, behavior, and genetic characteristics. For the purposes of the Scientific Assessment (Aquatic STAR 1996), chinook salmon that migrate seaward as yearlings are called "stream-type" and those that migrate as subyearlings are called "ocean-type." Snake River chinook salmon (stream- and ocean- types) were listed as threatened under the Endangered Species Act in 1992, and critical habitat was designated in 1993. (See Appendix E for a critical habitat map.) Current and historical distributions of chinook salmon are illustrated on maps 2-22 and 2-23.

The historical range of chinook salmon in North America was the eastern Pacific and Arctic oceans and accessible freshwater. Like steelhead, chinook salmon were found in all accessible areas of the Snake River downstream from Shoshone Falls, and they formerly ascended and spawned in reaches of Salmon Falls Creek, Nevada, more than 900 miles from the ocean. An estimated 10,523 miles of stream were accessible to chinook salmon in the Columbia River Basin in the United States and Canada.

Stream-type chinook salmon were widely distributed, occupying about 45 percent of the watersheds in the project area, and occurring in all ecological reporting units except the Northern Great Basin (ERU 4), Upper Clark Fork (ERU 8), Snake Headwaters (ERU 12), and Upper Snake (ERU 11) above Shoshone Falls. Ocean-type chinook salmon were much less widely distributed, occupying approximately 7 percent of the available watersheds and occurring in 6 of 13 ecological reporting units. Within accessible watersheds, chinook salmon distribution may have been restricted by unsuitable water temperatures at high elevations and the need for relatively large areas of suitable spawning gravel. Chinook salmon juveniles also prefer low gradient, meandering stream channels, which may have further restricted their distribution.

Historical runs of chinook salmon were immense; estimates of annual runs sizes prior to 1850 range from 3.4 to 6.4 million fish. Most American Indians in the project area shared a major dependence on salmon as a subsistence and ceremonial resource. Commercial harvest of chinook salmon in the mainstem Columbia River peaked in 1883 at 2.3 million fish, and the average yield was approximately 1.3 million fish from 1890 to 1920.

Chinook salmon are presently the most endangered of the key salmonids, with populations lost in large portions of their historical range. Construction of Grand Coulee Dam in the early 1940s and the Hells Canyon dam complex in 1967 eliminated chinook salmon from much of their former ranges within the Upper Columbia and Snake River drainages. In total, about 75 percent of historically accessible streams are no longer accessible to chinook, primarily because of dam blockages. Current known and estimated distributions of stream-type and ocean-type chinook salmon include 28 percent and 30 percent, respectively, of their historical ranges. Stream-type chinook are extinct in all of the Lower Clark Fork (ERU 9) and Owyhee Uplands (ERU 10); and in large portions of other ecological reporting units that currently support populations. Ocean-type chinook are extinct in large portions of several ecological reporting units, and in all of the Owyhee Uplands (ERU 10).

Most chinook salmon stocks in the remaining accessible range are severely depressed and at risk. For stream-type chinook salmon, watersheds known or estimated to support

strong spawning and rearing populations represent 0.2 percent of the historical range and 0.8 percent of the current range; approximately 99 percent of the current stream-type chinook spawning and rearing populations are classified as depressed. The only remaining strong populations appear to be restricted to small areas of the John Day River Basin in the Blue Mountains (ERU 6). Ocean-type chinook are found in a more restricted range associated mainly with the mainstem rivers and larger tributaries. For ocean-type chinook salmon, watersheds known or predicted to support strong spawning and rearing populations represent 5 percent of the historical range and 16 percent of the current range; approximately 70 percent of current ocean-type chinook salmon spawning and rearing populations are classified as depressed. In the Snake River, an estimated 1,882 naturally produced stream-type chinook salmon reached Lower Granite Dam in 1994 as compared to an estimated production of 1.5 million fish in the late 1880s. From 1985 to 1993, an average of 387 naturally produced ocean-type chinook salmon reached Lower Granite Dam.

Construction and operation of mainstem dams on the Columbia and Snake rivers is considered a major cause of decline of chinook salmon (map 2-21). Besides reducing accessible habitat, hydroelectric development changed Columbia and Snake River migration routes from mostly free-flowing in 1938 to a series of impoundments by 1975, and reservoir storage activities have reduced flows in most years during smolt migration. Like steelhead, chinook adults are delayed during upstream migrations, and smolts may be killed by turbines; become disoriented or injured, making them more susceptible to predation; or become delayed in the large impoundments behind dams. Development and operation of hydropower facilities in the Columbia Basin has reduced salmon and steelhead production by about eight million fish: four million from blocked access to habitat above Chief Joseph and Hells Canyon dams, and four million from ongoing passage losses at other facilities. Passage losses are cumulative depending on the number of dams; chinook salmon in the project area must pass one to nine dams. Losses of mid- and upper-Columbia ocean-type chinook salmon were estimated to be approximately 5 percent per dam for adults and 18 to 23 percent per dam for juveniles.

Like steelhead, many remaining chinook salmon populations have been influenced by hatchery-reared fish. Production of wild anadromous fish in the Columbia River Basin has declined by approximately 95 percent from historical levels. As a result, wild populations unaltered by hatchery stocks are rare; they are present in 4 percent of the historical range and 15 percent of the current range of stream-type chinook salmon, and 5 percent of the historical range and 17 percent of the current range of ocean-type chinook salmon. Only those watersheds in the project area containing spawning and rearing populations sustained by wild stocks are classified as strong.

The overall pattern of decline of chinook salmon suggests the species is sensitive to habitat degradation throughout its entire range. Improper livestock grazing, timber harvest, and irrigation diversions have been important factors. Reduced stream habitat diversity has been one of the most pervasive cumulative effects of forest management practices and may have altered fish communities. Forest management practices, including timber harvest activities, have reduced salmon habitat quantity, reduced habitat complexity, increased sedimentation, and eliminated sources of woody debris needed for healthy salmon habitat. In the Snake River Basin, more than 80 percent of the salmon production occurs on Forest Service- and BLM-administered lands. In portions of the Snake River Basin still accessible to salmon, management history on Forest Service-administered lands has reduced the suitability of approximately 1,926 miles of stream. Improving the quality of remaining refugia is less important than restoring connectivity in reaches of lower subbasins.

Predation is one of the major causes of mortality to juvenile chinook salmon. Exotic species may prey upon and compete with native fishes. Many of the middle and lower reaches of the Columbia River are dominated by exotic fish species. Northern squawfish, a native predator, has become well adapted to the habitat created by dams. It has been estimated that 15 to 20 million juvenile salmonids in the Snake and lower Columbia rivers are lost to northern squawfish predation.

The Effects of Hydropower, Hatcheries, Harvest and Habitat on Interior Columbia River Anadromous Fishes

Introduction

Anadromous fish are the focus of this sidebar because of their current scarcity resulting from influences of hydropower, hatcheries, harvest, and habitat. These four activities which impact or limit the survival of anadromous fishes, have been broadly grouped as the "Four H's (Idaho Department of Fish and Game et al. v. NMFS et al. 1994). Due to the cumulative effect of the "Four H's" on Snake River spring/summer chinook salmon, the National Marine Fisheries Service (NMFS) listed the Snake River stock as threatened in 1992 pursuant to the Endangered Species Act (ESA). In public scoping for this draft EIS an important question surfaced about how hydropower, harvest, and hatcheries (factors outside the land management agencies' jurisdictions), would be considered in the development of alternative Forest Service and BLM land management strategies which affect anadromous fish habitat. The Executive Steering Committee for the ICBEMP directed that the EISs specifically address the following:

1. *What are the relative contributions of habitat, hydropower, hatcheries, and harvest on the current state of populations within the interior Columbia Basin?*

2. *If all other factors were held constant, would a further degradation of habitat increase the risks of extirpation or extinction?*

3. *If all other factors were held constant, would an improvement in freshwater habitat conditions increase fish abundance and reduce the risks of extirpation or extinction?*

4. *If nothing is done to restore habitat and mitigation of major factors such as the dams is successful, would there be sufficient habitat available to accommodate increasing fish numbers?*

Habitat for anadromous fish is also important for numerous other aquatic and riparian resources and human uses, including: native trout, amphibians, recreation, and clean water. Alternative land management strategies will consider these important resource values in addition to the anadromous fish issues discussed below.

This summary, based on a Science Integration Team report (Lee and Rieman In prep.) and other relevant sources cited in the text, responds to the above four questions. It provides an overview of the effects of habitat, harvest, hydropower and hatcheries on interior Columbia River anadromous fishes. It does not apply to resident native fish such as bull trout and cutthroat trout, which do not migrate to and from the sea. The information is generally applicable to spring/summer and fall chinook, sockeye, and steelhead in the interior Columbia Basin.

Hydroelectric development is generally regarded as a major factor in the decline of anadromous populations, irrespective of changes in freshwater habitat (Northwest Power Planning Council 1986 in Lee and Rieman In prep., Raymond 1988 in Lee and Rieman In prep.). Explicit recognition of the role of hydroelectric development contributed to passage of the Northwest Power Planning and Conservation Act of 1980, and to development of the Northwest Power Planning Council's Fish and Wildlife Program, a regional effort to simultaneously address the four principal factors affecting anadromous fish.

Habitat is another major factor in supporting anadromous fish populations. The information provided by the broad-scale assessment of aquatic habitats and species within the interior Columbia Basin and presented in the Aquatic STAR (Lee, D.; Sedell, J.; et al. 1996) lends support to a scientifically credible view that is emphasized repeatedly in the literature: habitat change is pervasive and at times dramatic, but impacts are not evenly distributed across the landscape. For instance, high-quality areas,

generally associated with wilderness or other protected areas, remain that are capable of supporting anadromous fishes at near historical levels in these areas. In many other areas habitat has been degraded and survival of the freshwater life stages has been compromised. To support recovery of populations of anadromous fish, it will be necessary to expand and reconnect areas of high quality habitat. Restoration of depressed populations cannot rely on habitat improvement alone, but requires a concerted effort to address causes of mortality in all life stages. These include freshwater spawning, rearing, juvenile migration, ocean survival, and adult migration.

1. ***What are the relative contributions of habitat, hydropower, hatcheries, and harvest on the current state of populations within the interior Columbia Basin?***

   The question of relative contributions of the "Four H's" to anadromous fish mortality cannot be answered precisely. Simultaneous changes in a variety of factors, combined with the lack of historical data, prevents estimation of the proportionate influence of each factor across the entire basin. It is expected that the contribution of freshwater habitat changes to declines in anadromous fish populations is least in the less disturbed areas of central Idaho (such as in wildernesses or other protected areas), where there are the most dams between spawning and rearing areas and the ocean, and in the northern Cascades, but greater in the lower Snake and mid-Columbia drainages. Similarly, the contribution of hydropower to fish mortality declines downriver where there are fewer dams between freshwater spawning and rearing areas and the ocean (Lee, D.; Sedell, J.; et al. 1996). Hatcheries are an important element throughout the basin, but their effects on native stocks are quite variable. Harvest, which has been much curtailed in recent years, has less of an effect today than it did historically. In some sub-basins such as the Umatilla, irrigation withdrawals may be the major contributor to declines in naturally reproducing populations.

2. ***If all other factors were held constant, would a further degradation of habitat increase the risks of extirpation or extinction?***

   Yes, regardless of the contributions of other factors, spawning and juvenile rearing habitat remains an important component in the viability equation. Freshwater habitat can be most important in ensuring viability of stocks that are depressed through a combination of other factors.

3. ***If all other factors were held constant, would an improvement in freshwater habitat conditions increase fish abundance and reduce the risks of extirpation or extinction?***

   Yes, although the magnitude of the effect would vary greatly from sub-basin to sub-basin. In areas where present habitat is degraded and hydropower effects are smaller, such as the John Day and Deschutes Rivers, habitat improvements could result in immediate increases in numbers of fish. In areas where habitat is degraded and hydropower effects are large, such as in the Grand Ronde River and some tributaries of the Salmon River (for example Panther Creek), increases in population numbers due to habitat restoration would be more modest and gradual. In other areas where there is abundant high-quality habitat but few adult spawners, such as in the middle Fork Salmon River, immediate increases in fish abundance would not be expected. One aspect of habitat improvement that could have long-term repercussions, if not immediate benefits, is that increased availability of high-quality habitats reduces the chances that a random, catastrophic event such as a large fire followed by flooding would wipe out all of the best available habitat. A wider distribution of high-quality habitats also improves the likelihood of increased genetic diversity~ an additional benefit over the long term. In general, while additional high quality habitat alone could increase the abundance of individual fish, it would not likely reverse current negative population trends in the short term.

4. ***If nothing is done to restore habitat, and mitigation of major factors such as the dams is successful, would there be sufficient habitat available to accommodate increasing fish numbers?***

The answer varies across the basin. Population numbers in much of the interior Columbia Basin are far below what current habitat conditions could likely support under a scenario of increased downriver survival. Some remote areas (for example central Idaho and northern Cascades) potentially could support hundred-fold increases or better in the number of adult fish, but this is not the case everywhere. There are disturbed areas where increased adult numbers would lead to compensatory declines in freshwater survival rates, thus reducing the per capita productivity of the population and limiting the effectiveness of downstream improvement efforts. If the objective is to fully realize the benefits of downstream improvements, then commensurate increases over current availability and distribution of high-quality habitat will be necessary.

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Summary by ERU:

Chinook salmon are the most imperiled of the key salmonids. Both forms of chinook salmon are extirpated in more than 70 percent of the historical range. The distribution of stream-type chinook appears to be widespread throughout the remaining accessible range, but most populations are depressed and influenced by hatchery supplementation. The only remaining strong populations are within the Blue Mountains (ERU 6) and are restricted to relatively small areas of the John Day River Basin. Within the Central Idaho Mountains (ERU 13), recent runs of stream-type chinook salmon have been critically low, and most populations are believed to be on the brink of extinction. Ocean-type chinook salmon are found in a more restricted range tied principally to mainstream rivers and larger tributary systems. Populations associated with the Snake River Basin in Idaho are also considered on the verge of extinction. The remaining distribution of spawning and rearing habitat includes very few watersheds in each occupied ecological reporting unit and the blocks of contiguous occupied habitat are small and disjunct.

Sockeye Salmon

Sockeye salmon were not considered a "key salmonid" as part of the Scientific Assessment (1996) because of their extremely limited present distribution. Nevertheless, they are an important species because of high associated social, economic, and ecological values.

Sockeye salmon exhibit two dominant life history forms, an anadromous form and a resident form called kokanee. The distribution of kokanee coincides with that of the anadromous form, probably indicating that kokanee populations have developed from anadromous populations. The historical range of sockeye extended across the northern rim of the Pacific Ocean, down the west coast of North America as far south as the Sacramento River in California (see map 2-12, earlier in this section). The historical range included large segments of the interior Columbia Basin where natural lakes and surrounding watersheds are connected by river systems to the Pacific Ocean. It is believed that 11 major watersheds and at least 24 lakes supported sockeye salmon within the project area. Currently only Lakes Wenatchee and Osoyoos in the upper Columbia River produce large numbers of wild anadromous sockeye. A single remnant population of anadromous sockeye remains in Redfish Lake in the upper Snake River Basin. The number of adults returning to Redfish Lake has numbered from zero to 8 adults since 1990. This remnant population is federally listed as endangered under the Endangered Species Act.

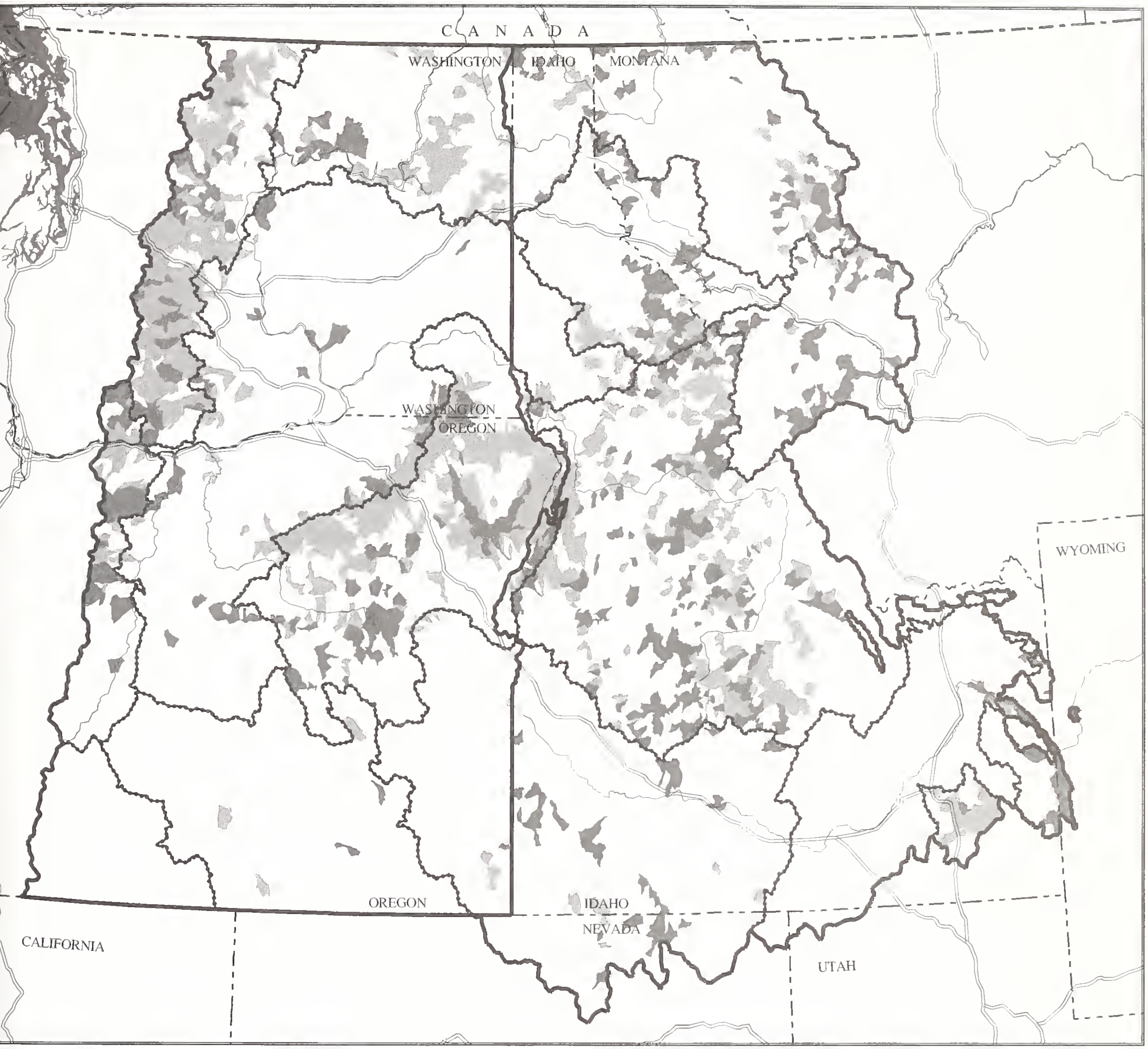
Similar to steelhead and chinook, much of the decline in anadromous sockeye is attributed to dams blocking access to spawning and rearing streams and increased mortality of juveniles in the migratory corridors of the Snake and Columbia rivers. Other factors influencing abundance include loss of lake habitat, historical commercial fisheries, ocean productivity, and forest management.

Native Species Richness, and Biotic and Genetic Integrity

The specific conditions regarding fish species and groups of fishes that are outlined in preceding sections can be integrated in various manners to provide an overall picture of aquatic conditions in the project area. Some key attributes include native species richness, and genetic and biological integrity. These views can help prioritize management actions through watershed categorization or designation of key watersheds. Key (or priority) watersheds have been identified for previous salmon recovery plans (see sidebar earlier in this section). For the purposes of this EIS, the Science Integration Team developed watershed categories that summarize current aquatic conditions, especially with regard to management opportunities and priorities.

Species Richness

The number of native fish species (species richness) present in a watershed is an important element of biodiversity. A high degree of overlap in species should be characteristic of strong habitat diversity. Even considering a fairly narrow group of species such as the salmonids, each species relies on



50 0 50 100 150 miles

50 0 50 100 150 km

N

Map 2-24.
Salmonid Strongholds

Predicted Strongholds

Known Strongholds

Major Rivers

Major Roads

EIS Area Border

ERU Boundaries

BLM and Forest Service Administered Lands Only

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**Ecological reporting unit names and numbers are found on Map 1-1.*

different habitats and environments. The occurrence of several salmonids indicates suitable habitats over relatively large landscapes. High richness may also indicate critical habitats that serve as common corridors, wintering areas, or seasonal refuges for varied life histories. The largest remaining regions of high species overlap considering *all* native fish species are associated with the Central Idaho Mountains (ERU 13), Blue Mountains (ERU 6), Northern Cascades (ERU 1), and their connecting river corridors.

Overlap of strong populations for multiple native *salmonids* indicates areas of high species richness that have not yet experienced extensive declines in fish population. Presently within the project area, less than 0.01 percent of the sub-watersheds concurrently support three strong salmonid populations, 3 percent support 2, and approximately 20 percent support 1. The largest block of contiguous or clustered sub-watersheds supporting strong populations is within subbasins in the Central Idaho Mountains (ERU 13), Blue Mountains (ERU 6), and Snake Headwaters (ERU 12). Smaller blocks are found in the Upper Clark Fork (ERU 8) and the extreme eastern fringe of the Northern Glaciated Mountains (ERU 7). Most of the watersheds supporting strong populations are found on Forest Service-administered lands (75 percent), and a portion (29 percent) are located within protected areas represented by designated Wilderness or National Parks. Watersheds with multiple strong populations are more commonly under Forest Service management than other ownerships. Map 2-24 illustrates the current and estimated locations of key salmonid strongholds in the project area.

Biotic Integrity

The concept of biotic integrity has been proposed to evaluate the loss of natural diversity and to define those remaining portions of the landscape that could be most valuable in maintaining or closely approximating historical levels of natural diversity. Biotic integrity has been generally defined as "the ability to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of the natural habitat of the region " (Karr and Dudley 1991 as cited in the Aquatic STAR 1996). Integrity specifically refers to *native* biota that reflect natural

Fringe Environments

"Fringe" environments at the extreme edges of a species distribution may support a disproportionately large part of the genetic diversity within a species because of the genetic adaption needed to survive in a variable environment. Populations that represent native gene complexes and the widest possible diversity probably offer the best resources for reestablishing extinct populations in similar environments. They are also important for sustaining the most important components of overall genetic diversity characteristic of these species.

The fringe of the range for westslope cutthroat trout is in the Blue Mountains (ERU 6). Watersheds within the Columbia Plateau (ERU 5) technically qualify as part of the westslope cutthroat fringe distribution, but those watersheds are really part of a much larger distribution of cutthroat in the upper portions of that basin. For that reason the Columbia Plateau (ERU 5) was not included as part of the fringe for westslope cutthroat trout. The fringe defined for bull trout includes the Southern Cascades (ERU 2), the Upper Klamath (ERU 3), the Owyhee Uplands (ERU 10), and the Walla Walla and Umatilla drainages within the Columbia Plateau (ERU 5).

The Upper Klamath (ERU 3), Northern Cascades (ERU 1), and Owyhee Uplands (ERU 10) are recognized as fringe areas in the remaining distribution of resident-interior redband trout. No watersheds are considered to represent a fringe for Yellowstone cutthroat trout or resident redband trout. Any further loss of current distributions within the Upper Snake (ERU 11) or Upper Klamath (ERU 3) would make these areas of concern, however.

The Northern Glaciated Mountains (ERU 7) was identified in the Scientific Assessment (1996) as the fringe for steelhead. Population declines within the Southern Cascades (ERU 2) could make that area important for steelhead as well. The Southern Cascades (ERU 2) and Northern Glaciated Mountains (ERU 7) are important for stream-type chinook salmon. The distribution of ocean-type chinook salmon within the project area is so restricted that all of the remaining distribution qualifies as part of the fringe.

evolutionary and biogeographic processes. Several measures of biotic integrity have been developed, often reflecting different attributes for communities of invertebrates and amphibians as well as fish (Fisher 1989; Lyons et al. 1995 as cited in the Aquatic STAR 1996).

Because project-wide information was limited to fish in the Scientific Assessment, a relatively simple measure of integrity was developed reflecting the diversity and structure of the native fish community at both the life-history and species levels of organization (Aquatic STAR 1996). The highest concentration of high integrity values were found in the Northern and Southern Cascades (ERUs 1 and 2), Blue Mountains (ERU 6), Central Idaho Mountains (ERU 13), and the southern edge of the Columbia Plateau (ERU 5). Smaller blocks of high values were also found in the Lower Clark Fork (ERU 8). One readily apparent trend is that many of the high-value integrity areas are found in forested areas within the range of anadromous fish. Rangeland and agricultural areas tended to have lower integrity values.

Genetic Integrity

Hatchery programs may erode genetic diversity and alter certain gene complexes that evolved together and are characteristic of locally adapted stocks of salmonids. The effects may include a loss of fitness or performance (growth, survival, and reproduction) and a loss of genetic variability important to long-term stability and adaptation in varying environments. The analysis of genetic integrity is incomplete and would require a finer level of analysis for a consistent application to resident salmonids, but in general the areas important to the genetic integrity of the anadromous salmonids are found principally within the Blue Mountains and Central Idaho Mountains ERUs.

Watershed Categories

To assist with an ecosystem approach to the management of watersheds and aquatic resources, the Science Integration Team developed a simple classification of subbasins throughout the Interior Columbia Basin Ecosystem Management Project area (Aquatic STAR 1996). Subbasins were used as the primary classification unit because they commonly approximate complete aquatic ecosystems, supporting most of the life-history diversity expected over larger river basins (see the Introduction to this chapter for an explanation of subbasins and fourth-field hydrologic unit codes). Three broad categories of subbasin condition (as it relates to aquatic ecosystems) have been defined, recognizing that a continuum of conditions exists. Subbasins were categorized along a gradient of conditions relative to highly functional aquatic ecosystems. Highly functional systems were defined as subbasins with a full complement of native fish and other aquatic species, well distributed in high quality, well connected habitats.

The categorization is intended to set the stage for a broad-scale analysis of management needs and opportunities that can focus the need for finer-scale analysis. It is intended to facilitate the discussion of management opportunity and conflict by providing a description of aquatic issues and needs that could be associated with similar descriptions for terrestrial ecosystems. It is not intended to be all inclusive, final, or inflexible. The classification is based on the integration of current data as well as local knowledge of watershed connectivity and condition that is not expressed quantitatively. Map 2-25 shows the watershed categories developed by the Science Integration Team for analysis.

Category 1 Watersheds

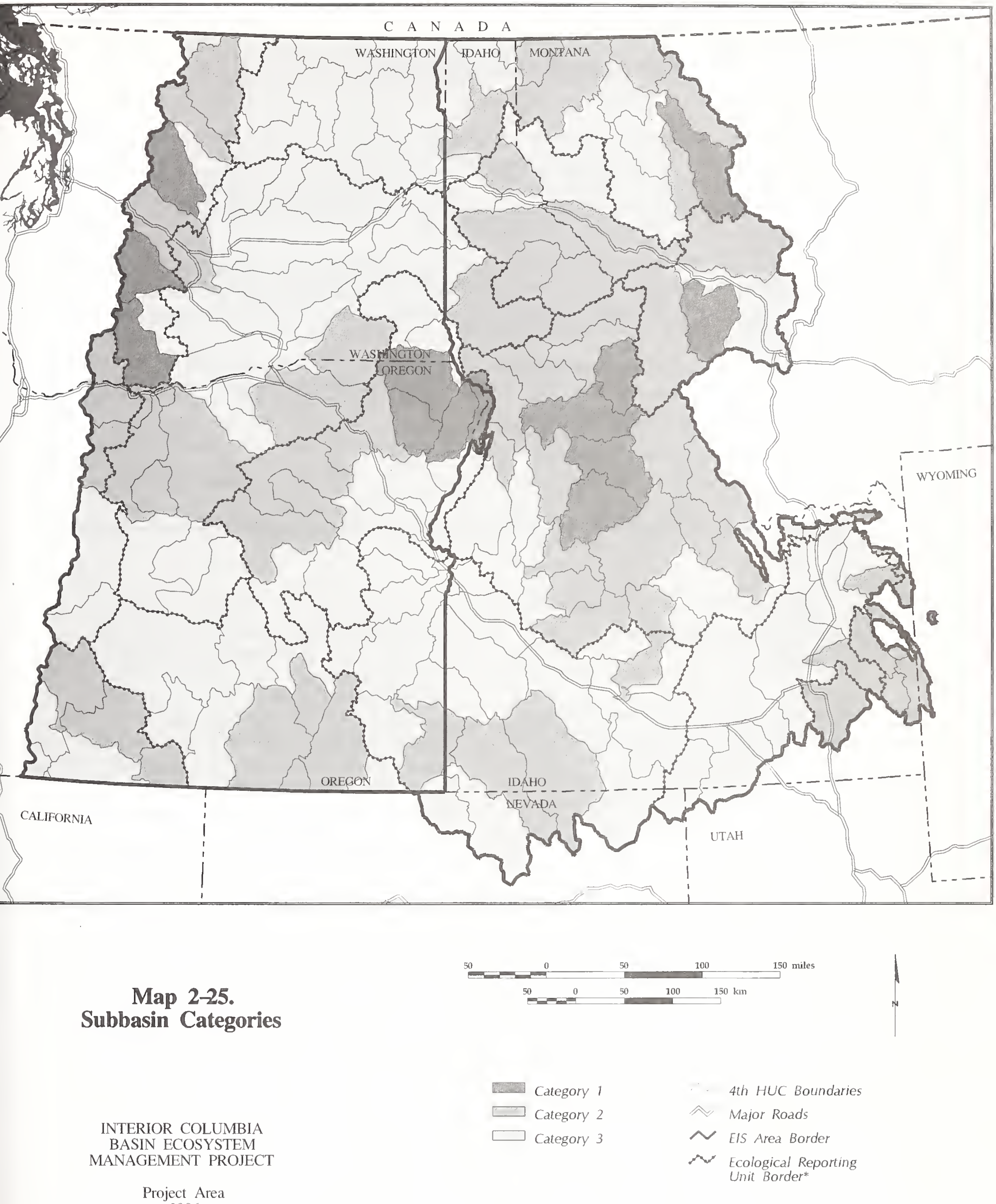
These subbasins most closely resemble natural, fully functional aquatic ecosystems. In general they support large, often continuous blocks of high-quality habitat and watersheds with strong populations of multiple species. Connectivity is unimpeded among watersheds and through the mainstream river corridor, and all life histories, including migratory forms, are present and important. Native species predominate, though introduced species may be present. These subbasins provide a system of large, well dispersed habitats that are resilient to large-scale disturbances. They provide the best opportunity for long-term persistence of native aquatic assemblages and may be important sources for refounding other areas. In general, land management of these areas should be highly conservative and integrated with other agencies to minimize risk to aquatic resources. Because these areas are generally large and robust enough to deal with large-scale fire events and other uncertainties, they are not the place for large-scale experimentation.

Category 2 Watersheds

These subbasins support important aquatic resources and often have watersheds classified as strongholds for one or more species scattered throughout. The integrity of the fish assemblage is high or moderate. The most important difference between Category 1 and Category 2 watersheds is increased fragmentation in Category 2 that has resulted from habitat disruption or loss. These subbasins have numerous watersheds where native species have been lost or are at risk. Connectivity among watersheds exists through the mainstream river system, or has the potential for restoration of life-history patterns and dispersal among watersheds. Reestablishing the necessary mosaic of habitats will often require conservation of existing high-quality sites, as well as the restoration of whole watersheds that still support remnant populations. Opportunities for conservation and restoration will rely heavily on more detailed analyses with finer-scale information. Because these subbasins commonly fall in some of the more intensively managed landscapes, they may have extensive road networks and the greatest need and opportunity for restoration of structure and composition of vegetation communities. There also may be opportunities to leverage active watershed restoration with active forest structural manipulation/treatment. For example, where extensive road networks exist, harvest and thinning activities might be focused over a relatively short period, and include road removal following completion. Because stronghold watersheds that require conservative protection are scattered rather than contiguous, intensive forest management might be prioritized and focused in areas that minimize risks to stronghold watersheds. These subbasins are more likely to have the opportunities to explore or experiment with watershed restoration through active manipulation, or through attempts to produce more episodic disturbance followed by long periods of recovery. Conceivably, these subbasins offer the greatest opportunity for positive solutions across multiple resource issues.

Category 3 Watersheds

These subbasins may support populations of key salmonids or have other important aquatic values, such as threatened and endangered species, narrow endemics, and introduced or hatchery supported sport fisheries. In general, however, these watersheds are strongly fragmented by extensive habitat loss or disruption throughout the component watersheds, and most notably through disruption of the mainstream corridor. Major portions of these subbasins are often associated with private and agricultural lands not managed by the Forest Service or BLM. Although important and unique aquatic resources exist, they are usually localized. Opportunities for restoring connectivity among watersheds, full expression of life histories, or other large-scale characteristics of fully functioning and resilient aquatic ecosystems are limited or nonexistent in the near future. Opportunities for management of aquatic resources in these subbasins are primarily in conserving remaining habitats in specific locations, rather than restoration of a more functional mosaic. Although there may be greater flexibility in land-use management for subbasin areas outside of critical watersheds, some management conflicts may arise. Because the remaining aquatic resources are often strongly isolated, risks of local extinction may be high. Land-use activities within these watersheds may call for extreme caution to not aggravate present conditions. Conservation of the remaining productive areas may require a disproportionate contribution from Federal management agencies, because these subbasins often include large areas of non-Federal land.



Map 2-25.
Subbasin Categories

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996

*Ecological reporting unit names and numbers are found on Map 1-1.

Human Uses and Values

Key Terms Used in This Section

Allowable Sale Quantity (ASQ) ~ On a National Forest, the quantity of timber that may be sold from a designated area covered by the forest plan for a specified time period.

Amenity ~ Resource use, object, feature, quality, or experience that is pleasing to the mind or senses; typically refers to values for which monetary values are not or cannot be established, such as scenic or wilderness values.

Animal Unit Month (AUM) ~ The amount of feed or forage required by one animal-unit grazing on a pasture for one month. An animal-unit is one mature cow plus calf, or one horse, or five domestic sheep.

Community (human) ~ a group of people residing in the same place and under the same government. A "Community of interest" refers to people who share a common concern but may not be located in the same place.

In-migration ~ The movement of new residents into an area.

Out-migration ~ The movement of former residents away from an area.

Resiliency (human community) ~ The ability of a community to respond to externally induced changes such as larger economic and social forces.

Summary of Conditions and Trends

- The planning area is sparsely populated and rural, especially in areas with a large amount of agency lands. Some rural areas are experiencing rapid population growth, especially those areas offering high quality recreation and scenery. Population growth can stimulate economic growth, provide new economic opportunities, and promote economic diversity in rural areas.
- Development for new residents is encroaching on previously undeveloped areas adjacent to lands administered by the Forest Service or BLM. New development can put stress on the political and physical infrastructure of rural communities, diminish habitat for wildlife, and increase agency costs to manage fire to protect new development.
- A wide variety of uses of Federal lands in the UCRB contribute to the regional economy and to local economies. At the regional level recreation is an important use of Federal lands in terms of economic value and amount of use. Most recreation use is tied to roads and accessible water bodies, although primitive and semi-primitive recreation is important. At the local level there are communities that rely on economic contributions from forest products, livestock grazing, mining, and recreation. Forest products and livestock grazing, while no longer solely dictating the economic prosperity of the region, remain economically and culturally important in rural areas distant from population centers and not sharing in regional growth.
- The public has invested in building road systems on agency lands in the UCRB planning area, primarily to serve commodity uses. On National Forest System lands, commercial timber harvest has financed 90 percent of the construction cost and 70 percent of the maintenance cost. Recreation now accounts for 60 percent of the use. Trends in timber harvesting and new road management objectives make the cost of managing these road systems an issue of concern.
- Costs of fire suppression on Federal lands in the UCRB have increased markedly in recent years and are

expected to continue to increase, unless actions are taken to address fuel loading and vegetation structure, composition, and density.

- For those counties that have benefitted from Federal sharing of gross receipts from commodities sales on agency lands, changing levels of commodity outputs can affect county budgets.

- Agency social and economic policy has emphasized the goal of supporting rural communities, specifically promoting stability in those communities deemed dependent on agency timber harvest and processing. Even-flow of timber, bidding methods, export restrictions, and small business set-asides of timber sales have been the major policy tools on Forest Service-administered commercial forest lands. Regulation of grazing practices has been most important policy tool on BLM-administered rangelands.

- The factors that appear important in making communities resilient to economic and social change include population size and growth rate, economic diversity, social and cultural attributes, amenity setting, and quality of life. The ability of agencies to improve community resiliency depends on how land-use choices influence these factors.

- Predictability in timber sale volume from agency lands has been increasingly difficult to achieve. Advancing knowledge, changing societal goals, administrative and legal challenges of timber sales, and changing forest health conditions have undermined conventional assumptions about timber supply from agency lands.

- Residents in the interior Columbia River Basin indicate strong support for a variety of land-use activities, but public opinion is divided on some issues where a choice and trade-off are required. Trust or confidence in the Forest Service and BLM as land managers is strong at the national level, less so at the regional level. There is increased public interest in having a greater role in natural resource decision-making.

Introduction to Human Uses and Values

This section describes current social and economic conditions and trends in the interior Columbia River Basin, along with historical information needed to further explain how these conditions and trends developed. Unless attributed to other authors or sources, information for this section is drawn, primarily, from the Scientific Assessment Economic and Social Staff Area Reports (1996).

Information on current conditions and trends is presented at two main levels. The broadest level at which recent social and economic conditions are discussed is for the interior Columbia River Basin as a whole. A second level of analysis focuses on upper Columbia River Basin counties or communities grouped together either in terms of their perceived character (timber; recreation, tourism and retirement; ranching; mining; and, other) and/or based on their trading area within the UCRB, such as a large center of commerce like Boise and the surrounding counties that it serves.

The interior Columbia River Basin (project area) stretches from the crest of the Cascade Mountains in Oregon and Washington to the rugged peaks of the northern Rocky Mountains in Idaho, Montana, Wyoming, Utah and Nevada. It is very large, including 100 counties in parts of seven States and including 476 places (towns, villages, cities and census designated places) whose population is tracked by the U.S. Census. The project area is the heart of what was, in the early 1800s, known as the Oregon Country.

Historical Overview

American Indians have occupied the Columbia Basin for more than 12,000 years. It is likely that they were nomadic and followed and harvested the large mammals of the Pleistocene era (espeeially mammoths, mastodons, musk ox, and bison antitquus). After continued warming of the climate, American Indians changed their food sources to fishing and gathering practices, adapting to regional and local patterns of flora and fauna. Attachments formed to specific places for fishing, hunting, and gathering, and a yearly rhythm of seasonal rounds developed (figure 2-24, in the American Indians section of this chapter). By the time of

European settlement, the interior Columbia River Basin was home to an estimated 50,000 American Indians divided among several different language groups.

It is estimated that American Indians of the Columbia may have harvested 18 million pounds of fish annually, both for their own uses and for trade purposes. In the higher deserts and headwater areas, where fish were less abundant, American Indians hunted large wildlife species such as deer, pronghorn, bighorn sheep, moose, elk, bison, and bear for food and clothing. For some American Indians, edible plants (especially roots), celeries, berries, fruits, and nuts provided a significant amount of their nutritional needs. Some plants were used for ceremonial, medicinal, and/or commercial purposes. Hunting and fishing practices reflected a conservation ethic, such as catching principally male trout and salmon on the spawning beds and restricting fishing to nights or certain days, thus allowing a portion of fish to pass. Selective digging techniques employed in plant food harvesting and the time of harvests for native plants and animals also embodied conservation elements.

Contrary to many of the beliefs of non-Indian emigrants arriving in the region in the 19th century, the project area and adjoining areas were not pristine wildernesses, but ecosystems in which humans had an active role (MacCleery 1994; Woolfenden 1993). American Indians employed fire as a tool to manage vegetation, and these fires differed from fires ignited by lightning in terms of seasonality, frequency, and intensity (Lewis 1985). The low intensity, high frequency fires set by American Indians improved grazing; encouraged vegetation to provide browse for large mammals and berries for human and animal consumption; signaled other tribes or sent warnings; and became part of ceremonial events. The widespread use of fires by American Indians over long periods shaped the mosaic of vegetation and their associated animal communities in the interior West.

The abundant harvestable resources of the Columbia basin were the principal attraction for early European settlers. The 1840s brought profound change as the success of early missions, fur trade, and establishment of trading posts led families to make the nearly 2000 mile trek on the Oregon Trail from Independence, Missouri, to the Willamette Valley in Oregon. Massive migration to the interior Oregon Country, however, did not begin until the discovery of gold in the northern Rocky Mountains in 1859. The development of "local" economies that resulted from mining led to new territories being formed (Idaho in 1863 and Montana in 1864). Transportation systems (wagon roads, steamboats and later railroads) were rapidly developed to link the mines to trade centers and to the outside world.

The growing population in California's cities created a market for timber and food that could be produced in the Pacific Northwest and shipped south along the coast. Commercial salmon fishing and canning became successful. Similarly, the arrival of the railroads in the late 1800s made it possible for ranchers to ship cattle and sheep to the major cities of the Midwest and eastern U.S. This access to markets, coupled with the ability to acquire, through the Homestead Act and other settlement acts, limited areas of meadow land and the better watering places (Penny and Clawson 1962) led to rapid growth in livestock operations. The land grants given to the railroads also spurred development, with establishment of communities as transportation centers and with significant forest lands coming under private ownership, which also contributed to the establishment of a timber economy.

Following on the heels of mining and agriculture, a third leg of the interior Columbia Basin's economy, the timber industry, took off near the close of the 19th century. Serving only local markets in the early years after settlement, the industry paralleled development of mines and railroads. Railroads needed wood for ties and trestles, mines needed timbers for shoring, and lumber mills needed access to the woods to extract logs. Throughout the period from the mid 1800s till the early 1900s, a disposal philosophy of public lands was dominant in Congress, and thus management of the public domain were minimal (Clawson 1962).

By 1900, exhaustion of commercial timber from forests in the Great Lake States led timber investors to look southward and westward. The Pacific Northwest became the focus for wood supplies with large mills in Spokane, Washington, Potlatch, Idaho, and Klamath Falls, Oregon. Idaho sawmills supplied 745 million board feet annually by 1910 (Beckham 1995).

United States Government policies and presence of Federal lands have played a central role in control and settlement of the interior Columbia River Basin. Coupled with new Federal incentives to boost settlement in the West, the progressive movement at the beginning of the 20th century influenced leaders in government to emphasize "scientific" management of physical resources for more "efficient" development (Hays 1959). After nearly a century of policies to dispose of public lands, the Federal government began to view the remaining public domain as a storehouse to sustain productive values (Shannon 1991).

> *"The model was the U.S. Forest Service, established under the direction of Gifford Pinchot in 1905 to manage a growing inventory of Federal forest reservations that dated to 1891. Theodore Roosevelt entered office in 1901 with 41 million acres in reserves and left in 1909 with 151 million in the rechristened national forests. Pinchot's goal was scientific management to ensure a sustained yield of timber as a lasting contributor to national growth and the stability of local economies. In his view, national forests could protect water supplies for irrigation and western cities, provide cheap grazing for stock raisers, and repay the U.S. Treasury with timber sales" (Adams 1994, p. 473).*

The Taylor Grazing Act (1937) gave specific direction to the Bureau of Land Management. By leasing public lands to stockraisers, the act sought to "stop injury to the public grazing lands (excluding Alaska) by preventing overgrazing and soil deterioration; to provide for their orderly use, improvement, and development; (and) to stabilize the livestock industry dependent upon the public range." Range improvement projects were undertaken by the Civilian Conservation Corps, and local advisory boards were set up to allocate and manage the rangelands.

New Deal programs were critical in sustaining and building infrastructure in the interior Columbia basin. Perhaps the most famous of the Federal programs were the dam projects along the Columbia and Snake Rivers. Although the Army Corps of Engineers had been involved in surveys, navigation, and flood control along the Columbia River since the 19th century, nothing compared to the Great Depression and post World War II construction of major dams on the Columbia system. There was a broad public consensus to construct the dams, even though biologists recognized at the time that dams would be barriers to native salmon runs, a significant number which spawn in streams on BLM- or Forest Service-administered lands (Peterson 1995).

The Analytical Context for Human Uses and Values

A discussion of the comparative structure of economic, social, and political systems is necessary to provide the proper context for agency decisions regarding economic and social objectives. People-oriented policies of the Forest Service and BLM historically have had a local focus, emphasizing the well-being of individuals, user groups, and communities that are economically or socially connected to agency lands. This fact suggests that social rather than economic policy is the appropriate context for decisions affecting human uses of agency lands.

Human social, political, and economic systems are described and analyzed differently from one another. Social and political systems are made up of individually meaningful units that together form at least a rough hierarchical structure. Social units include individuals, families, small groups, societies, and cultures. Political units include communities, cities, counties, States, and the nation. The administrative units of the Forest Service and BLM are also political entities that exhibit a hierarchical structure. Politicians and agency managers seek to influence economic events within their respective jurisdictions. However, the nature of economic systems limits this influence. Economies change as resources constantly shift to more efficient uses according to market forces, changing technologies, and consumer preferences. Rather than a hierarchical structure of separate "units," economies are a complex web of interdependent economic relationships operating across many jurisdictions, both public and private, over a large area. The ability of political leaders and agency managers to achieve local economic objectives is limited by their ability to anticipate, account for, and influence larger economic forces.

In pursuing economic and social objectives, another factor is specific to how a planning problem is framed: the size of the area over which planned land management activities and products are specified. Effects of land-use decisions are very difficult to reasonably predict for areas smaller than those for which uses are specified. For example, if the location of planned timber harvest is no more specific than a multi-county area, the effects on timber-related employment on a smaller area, such as a single county, city, or community can be difficult to predict, although attempts have been made for north central Idaho, for example (Robison, McKetta and Peterson, 1996). For this Draft EIS, activities and land uses will be specified by ecological reporting unit (ERU), which are areas equivalent in size to several counties, but which rarely follow county or State boundaries (see Introduction to this chapter for more discussion of ERUs).

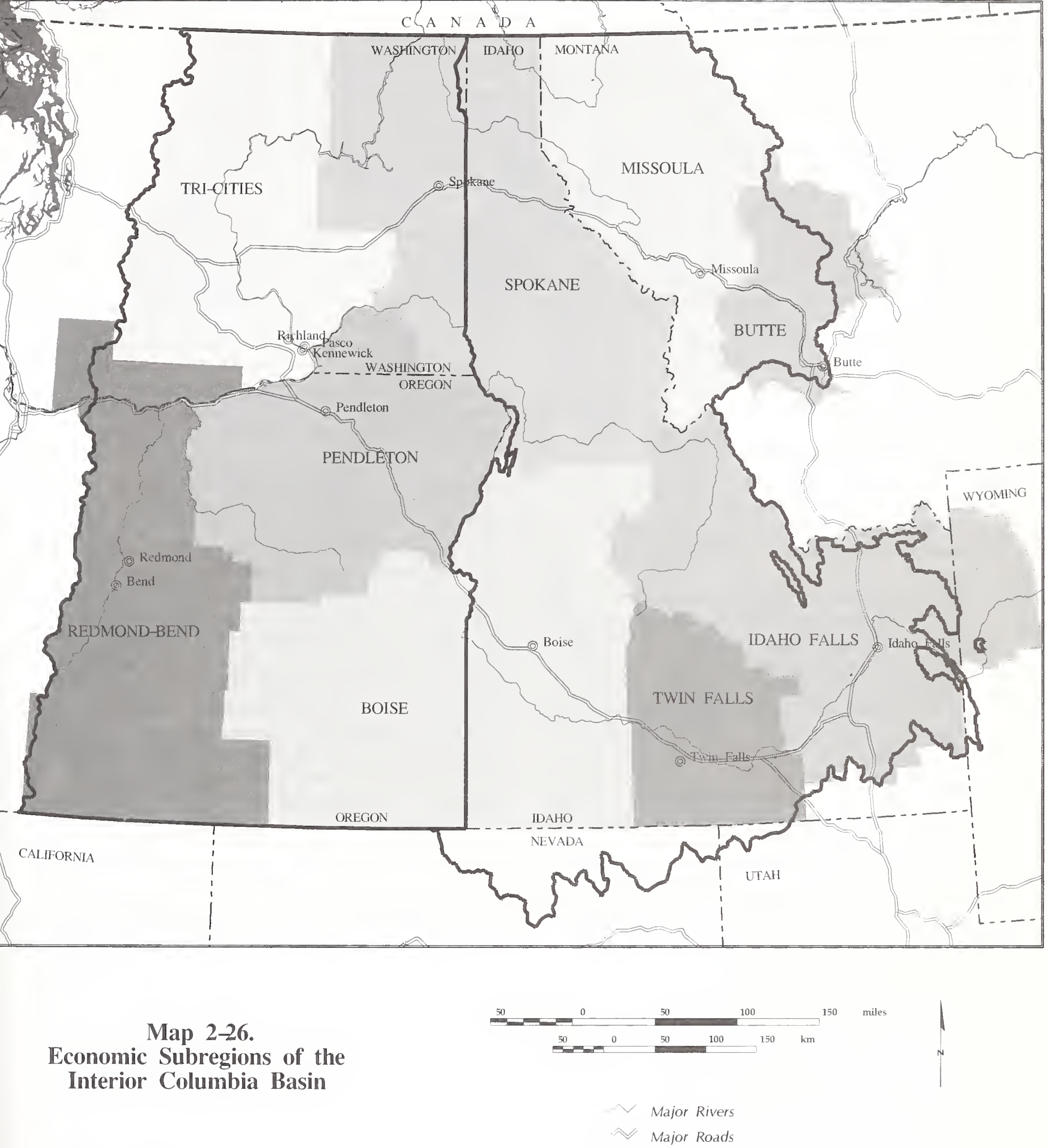
Project economists concluded that multi-county trade regions developed by the Bureau of Economic Analysis (BEA) were the smallest geographic areas acceptable as a reasonably "closed" economic system. BEA regions are based on commuting distances and newspaper circulation (see map 2-26). Since this plan uses ERUs for displaying outputs, BEA-type data will be adjusted to these units. Neither BEA regions nor ERUs correspond to the boundary of the UCRB planning area. This chapter supplements the larger area information with more detailed county-level data in order to help describe the human affected environment, but its use to project future economic effects of alternatives is severely limited. The discussion that follows addresses either UCRB planning area or ICBEMP project area conditions as is appropriate to the context of the discussion and the available data.

Population

From 1950 to 1990, the population of the ICBEMP project area grew substantially to well over two million people. While the basin as a whole saw increases in population in every decade, most rural counties in the project area experienced out-migration or loss of population during the period between 1950 and 1970 as residents moved to urban areas (part of a nationwide trend). During the 1970s, most counties in the basin—including rural ones—reported population increases. In the 1980s, the trend towards migration from rural areas to the cities reemerged, and over 40 percent of the rural counties in the basin had population declines. Preliminary information from the early 1990s suggests that another urban-to-rural migration has begun (with substantially all counties in the project area gaining population between 1990 and 1994). Since 1990, the population in the basin has been growing faster than national averages for all types of settings. Small metropolitan counties grew the fastest, at 6.3 percent. Non-metropolitan counties adjacent to metro ones had the next fastest growth rate at 5.8 percent. In the basin, this trend is most apparent in rural counties that are attractive to retirees or are centers of recreation. Counties with substantial recreation accounted for only 16.7 percent of the basin's population in 1990, yet they reported 21.7 percent of the total population increase in the project area from 1990 to 1994. Counties with high technology manufacturing (electronics, instruments, etc.) and services (medical, business, engineering and educational) also had relatively high growth rates during this period. As the population of the U.S. grows older and as more individuals and businesses access markets electronically or through airline and other shipping/delivery services, this trend of increasing migration to high quality of life rural areas is expected to continue.

Wildland-Urban Interface

In many areas, population growth and consequent development can threaten the qualities that make such places attractive for recreation, retirement, and new businesses. At the urban-wildland interface, where growth is dramatic, fire protection is becoming a critical issue (map 2-27). The growth in numbers of residential dwellings near forested landscapes has presented new challenges in fire prevention and suppression for Federal and local agencies. Fire protection in the wildland/urban interface is a significant enough issue that the Western Governors' Association recently initiated an effort with diverse interests to develop a "Wildland/Urban Interface Fire Policy Action Report. Federal land managers are called upon



Map 2-26.
Economic Subregions of the Interior Columbia Basin

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996

in the report to manage fuels in the interface areas (Western Governors' Association 1995).

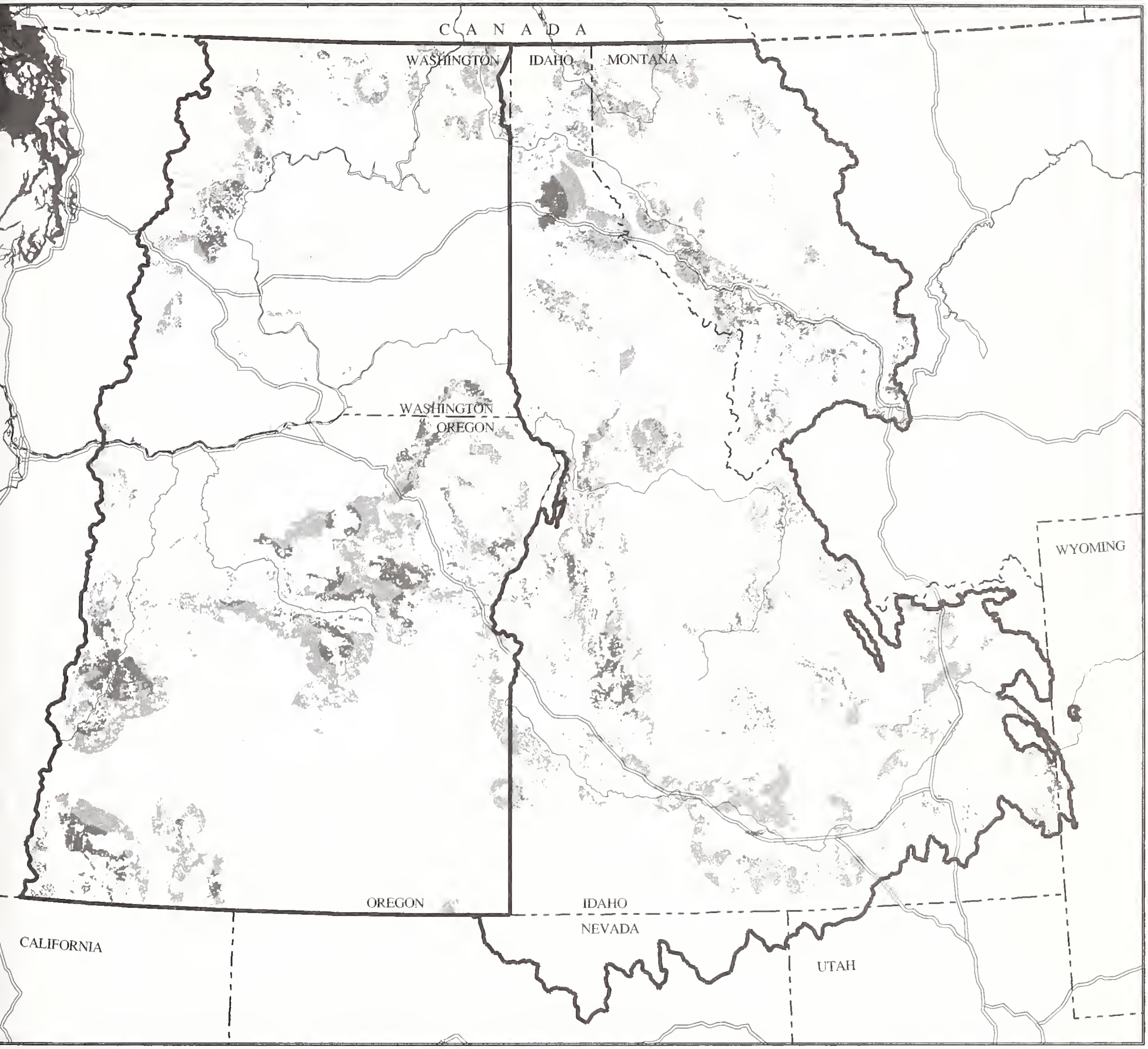
Increased conflicts with wildlife have occurred in the interior basin. Large mobile wildlife species with extensive home ranges often run into conflicts with humans and livestock when wildlife habitat is reduced or affected by roads, and when wildlife populations increase. Elk and white-tailed deer have expanded their ranges in recent times, causing animal damage problems on some private lands, including crop damage during drought years. Mountain lion and coyote populations, reduced in some areas, are increasing in the rural interface and causing more concern for human safety. Large carnivores (wolf, grizzly bear) may move to seek prey and potentially move into areas with livestock and high human habitation, where potential conflicts intensify. Attitudes of humans towards carnivores is likely more important for their well-being than habitat conditions (Terrestrial STAR 1996).

In spite of the increases in population discussed above, the basin remains far more rural than the U.S. as a whole: 77.5 percent of the U.S. population lives in urban areas compared to 31 percent of project area residents in urban areas, and over 90 percent of the 476 communities in the basin are considered to be rural (Harris, Brown and McLaughlin 1995). In keeping with its rural character, population density in the basin is less than one-sixth of the U.S. average (11 persons per square mile in the project area compared to 70 nationwide). The basin has a greater proportion of whites and Native Americans than the nation as a whole and a smaller proportion of African-Americans, Hispanics, and Asians. The percentage of residents of the project area with at least some college education is greater than the national average.

In the interior Columbia Basin, the rate of in-migration differed among the counties. One type of county that showed large increases was that in which recreation and tourism play a large role in the county economy (Johnson and Beale 1995) (map 2-28). In these counties, about 77 percent of the population growth is accounted for by net migration (Johnson and Beale 1995), compared to 60 percent and 57 percent in metropolitan and other counties.

Although agriculturally based lifestyles dominate the interior basin, lifestyles differ significantly in rural counties where rapid population growth is occurring. Compared to households nationally, lifestyles in rural rapid growth areas appear to be oriented more toward the natural environment, occupations related to natural resources, and recreation opportunities on federally managed resources (McCool and Burchfield, 1995). Lifestyles within the 20 counties with significant recreation in the project area also differed from regional averages, suggesting the importance of environmentally based amenities to the lifestyles of many people moving to the interior basin.

Photo 19: The growth in numbers of homes near forested landscapes is presenting new challenges for fire prevention and suppression. Photo by Karen Wattenmaker.



Map 2-27. Urban/Wildland Interface Fire Risk

BLM and Forest Service Administered Lands Only

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

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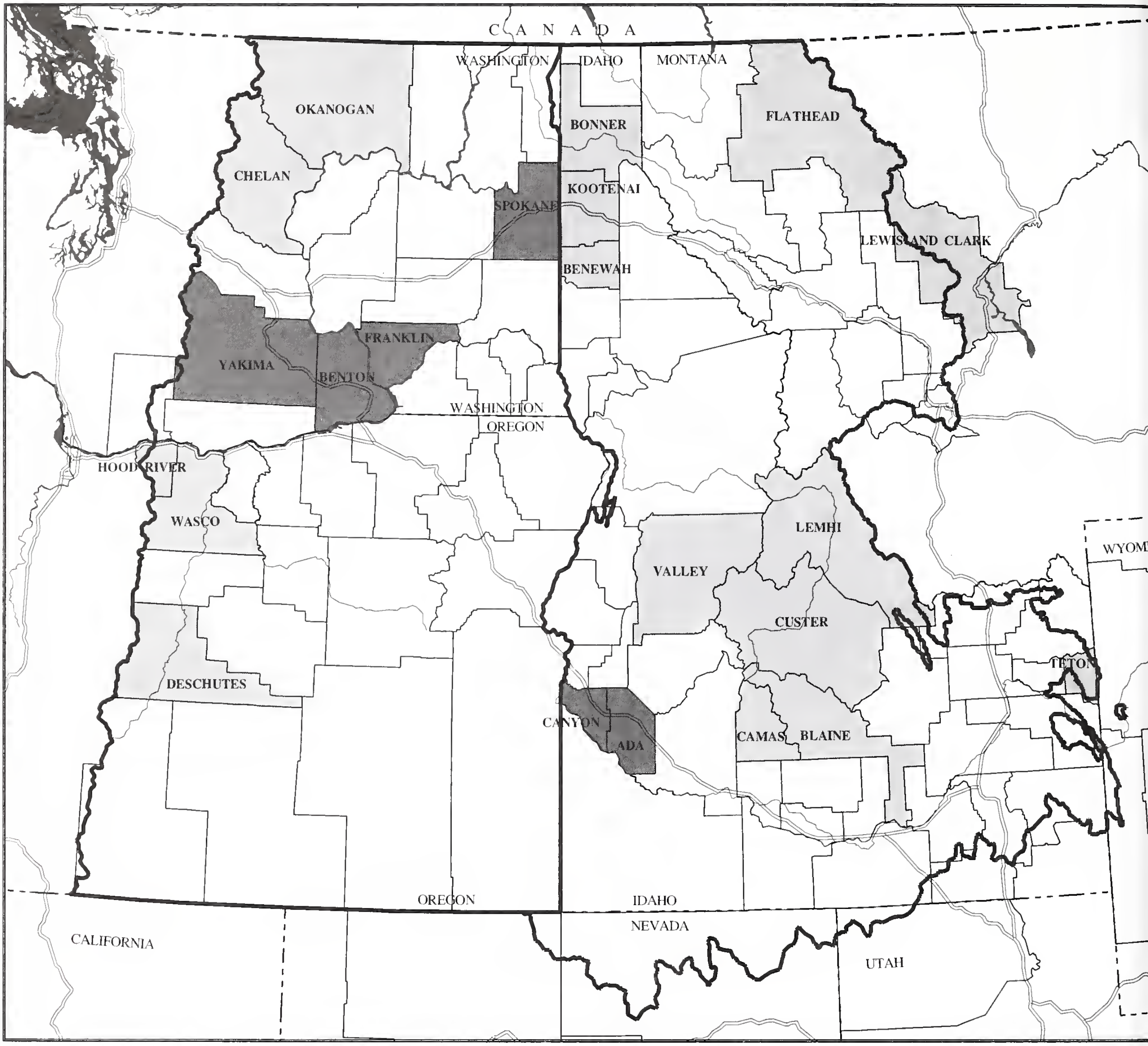
1996



Map 2-28.
Recreation and Metropolitan Counties

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

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1996

Land Ownership and Major Uses

Forest Service- or BLM-administered lands make up a substantial portion of the upper Columbia River Basin, so their use is regionally important. These lands are also substantial assets nationally, making their use important outside the region as well. Of the 74 million acres of land in those portions of Idaho, Nevada, Montana, and Utah in the Columbia River Basin, almost 42 million acres, or 57 percent, are administered by the Forest Service or BLM.

Forest Service- or BLM-administered lands were either reserved from settlement or were considered part of the public domain during the early part of the century. Beginning in the 1890s following passage of the Forest Reserve Act, Forest Reserves were established in the UCRB. An organic act for the administration of forest reserves was passed by Congress in 1897. Presidents Grover Cleveland and Theodore Roosevelt acted to establish millions of acres of such forest reserves in the following years. The U.S. Forest Service was established in 1905. In 1946 the BLM was formed by merging the earlier Grazing Service and the General Land Office, which had been charged with managing the public domain and its transfer to qualified applicants pursuant to a number of laws favoring transfer. The BLM operated without an organic act until 1976, with the passage of the Federal Land Policy and Management Act.

Recreation and Scenery

Historical Overview

The Forest Service early recognized the public's demand for recreation, receiving authority in 1915 to issue 30-year leases for developing summer homes, hotels, and other commercial services for the recreating public. The need to formalize authority to manage recreation was also a primary driver for passage of the Multiple Use-Sustained Yield Act of 1960, since the legal basis for managing recreation and other uses was limited by the general wording of the Organic Act (1897). The Recreation and Public Purposes Act of 1954 encouraged disposal of BLM lands (often to States) that were valuable for recreation uses. National Recreation Areas (NRAs) were authorized for Federal lands by Congress in 1962. They were meant to improve and assure the quality and supply of outdoor recreation opportunities close to areas of high population and growth. Two NRAs, the Sawtooth and Hells Canyon, are located in the Upper Columbia River Basin planning area. Congressional passage of the Wilderness Act in 1964 relied substantially on an argument that these lands provide, and should continue to provide, recreational opportunities. In 1968, Congress passed the Wild and Scenic Rivers Act and the and National Trails Act, which had major effects on both agencies' recreation programs. The Federal Land Policy and Management Act in 1976 and the amendments to the Land and Water Conservation also expanded the agencies' authorities to address recreation needs.

The project area provides recreational opportunities of local, regional, national, and international importance. The UCRB planning area has, on average, substantially greater amounts of available outdoor recreation opportunities compared to the national average, much of it supplied by Federal lands (Molitor and Bolon, 1995). Recreation opportunities on public lands in the project area have been inventoried using the Recreation Opportunity Spectrum (ROS), which considers charateristics such as road access, amount of development, density of recreationists, level of facility development, and natural resource management. Combined categories for this project include Primitive/Semi-Primitive (combining primitive, semi-primitive non-motorized, and semi-primitive motorized classes), Roaded Natural (roaded natural and roaded modified classes), and Rural/Urban (rural and urban classes). The ROS is a convenient way to inventory and display recreation settings, but it does not include the main attractions that draw people to recreation settings, such as water, fish, and wildlife. The presence of water has been and will continue to be the most important draw for recreation visitors. The project area contains an abundance of wild and remote water environments; the average for the project area is nearly three times the national average.

Federal lands supply large amounts of primitive and semi-primitive recreation opportunities, much of which has been given special status by Congress, such as in Wilderness or Wilderness Study Areas, Wild and Scenic Rivers, National Scenic Areas, and National Recreation Areas. The project area contains 70 percent of the unroaded areas 200,000 acres or greater in the lower 48 States, several in the UCRB. Few regions in the lower 48 States can match this combination of large-scale, undeveloped areas

and low human population density. Access to wildland-based recreation opportunities is important to the rural-oriented lifestyle of area residents and contributes importantly to the region's identity.

In the future, the project area is expected to continue to have proportionately greater amounts of available recreation resources compared to the nation as a whole. For most recreation environments, the resource base for the western portion of the United States is expected to grow more rapidly or decline more slowly compared to the eastern portion of the country (English et al. 1993).

Photo 20: Trail use in less-developed settings is expected to be one of the fastest growing recreation activities in the project area. Photo by Doug Basford.

Recreation Use

Between 1991 and 1993 an average of 200 million recreation activity days per year occurred on Forest Service- or BLM-administered lands in the interior basin. Half of this use occurred in the UCRB, where day use and motor viewing accounted for 45 percent of the recreation activity days. Camping, fishing, trail use, and hunting were the next most popular recreation activities. Roaded natural settings receive about 75 percent of all activity days. Activities such as trail use occur mainly in primitive/semi-primitive areas, while camping is mixed, with about half of the visits occurring in roaded natural settings and one-quarter each in primitive/semi-primitive and rural/urban settings.

According to the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation conducted by the U.S. Fish and Wildlife Service, just over six million people were estimated to have participated in wildlife-oriented activities within the project area. About 20 percent of these visitors were not residents. Wildlife viewing, photography, and related wildlife activities were more popular then hunting and fishing in the States of Oregon, Washington, Idaho, and Montana. Projections made by all four States in their Statewide Comprehensive Outdoor Recreation Plans showed that trail use, a majority of which takes place in less-developed settings, is expected to be one of the fastest growing activities.

A Harris and Associates (1995) public opinion poll covering Oregon, Washington, and Idaho found high participation rates for outdoor activities, notably higher among Idahoans questioned.

Percent who have fished or hunted in past year:

	Northwest (3 States)	Idaho Only
A lot	15%	28%
A little	28	28
Not at all	57	44
Percent who have hiked or camped in past year:		
A lot	22%	28%
A little	46	52
Not at all	31	19

Source: Harris and Associates (1995)

Recreational fishing in the Project area includes chinook, coho, and steelhead salmon, and rainbow, bull and cutthroat trout. Introduced brown trout and brook trout also are popular recreational fish. As the quality of traditional fisheries has declined, some fishing enthusiasts have shifted to introduced warm water species such as bass.

Scenery

Scenery is important to both residents of and visitors to the project area, contributing to quality of life and supporting economic benefits through recreation and tourism. According to the 1990 Resources Planning Act (RPA) program update, viewing scenery has the highest participation rate of any recreation activity in the United States, with approximately 21 percent of the population participating. The supply of scenery in the project area was measured in terms of landscape themes and degree of scenic integrity. Landscape themes were also identified for 394 ecological subsections within the project area.

Landscape Themes

Landscape Themes range from an essentially natural landscape, such as Wilderness, to one that is highly developed, such as an urban area. Themes indicate how people perceive environments in a very general sense. Themes are images formed by combining landscape character (natural attributes) and scenic condition (human or cultural attributes). They are not goals for future management, but rather show what currently exists. The five themes used to describe project area landscapes are Forest and Shrub/Grasslands (Naturally Evolving), Forest Lands (Natural Appearing), Shrub/Grasslands (Natural Appearing), Agricultural Lands, and Developed Areas.

Issues in Recreation Management

The most recent Statewide Comprehensive Outdoor Recreation Plan (SCORP) for each of the four main States was surveyed to help define other current recreation issues for public agencies: (1) The need for cooperation and coordination among land management agencies; (2) funding problems; and (3) maintenance and development of facilities.

Several other common issues, though not among all State SCORPs, include access, education/information, and liability.

Perhaps the biggest issue is financial. The supply and quality of recreation opportunities will decline relative to increases in population and use without continued investment and maintenance of recreational resources and facilities. Forest Service and BLM budgets for recreation are declining, making it difficult to adequately staff and maintain existing facilities and setting (Lundgren 1995). In response, Federal land managers are contracting out more and more recreation operations, from large-scale recreation and wilderness planning efforts to management of campgrounds and reservation systems for river running and other activities.

Photo 21: The project area contains world-class salmon and trout recreational fisheries. Photo by Doug Basford.

Scenic Integrity

Scenic integrity in the project area was described using five categories, ranging from very high, where the landscape is visually intact with only minute deviations, to low, where the landscape is heavily fragmented and human activities and developments strongly dominate the landscape character. Scenic integrity is not necessarily the same as high quality scenery. For example, large expanses of open grassland that contain few developments may score high on integrity, but may not be the type of landscape typically associated with high scenic quality. Similarly, landscapes may contain roads and other types of developments, and still be considered highly scenic.

A measure of Scenic Integrity for Federal lands was developed by the ICBEMP project by combining Geographical Information system (GIS) data on vegetative structure, landform, and road density. This inventory provides a broad depiction of existing scenic integrity within the project area. While scenic integrity is described as in good shape (just one percent was rated as very low and seven percent as moderately low), a comparison with location of areas of scenic integrity to the current forest conditions indicates that a significant portion of the areas rated with high or very high scenic integrity are also at risk from stand-replacing fire. While the impacts to scenery from some stand-replacing fires may be short-term (such as air quality and landscape fragmentation), many areas are at risk from a more severe fire regime uncharacteristic for that site, where longer term risks to soils and other resources affecting scenery could occur.

Cultural Resources

Federally administered lands must comply with a number of Federal laws and regulations protecting cultural resources, including the Antiquities Act and the National Historic Preservation Act.

Cultural resources are the nonrenewable evidence of human occupation or activity as seen in any area, site, building, structure, artifact, ruin, object, work of art, architecture, or natural feature, which was important in human history at the national, State, or local level. There is, however, more than one view of what constitutes cultural resources. The academic and legal definitions tend to focus on tangible evidence such as sites and artifacts. American Indians find this definition too narrow. They view their entire heritage, including beliefs, traditions, customs, and spiritual relationship to the earth and natural resources as sacred cultural resources (Columbia River System Operations Review FEIS 1996).

The project area has been occupied by humans for more than 12,000 years, hence it has much evidence of human activity. By its very nature this evidence is site specific and beyond the scope of the broad-scale nature of this document, but this in no way detracts from the significance of cultural resources or the need to appropriately protect them. The inventory, detailed descriptions, and protection or mitigation of site-specific cultural resources are better discussed on a local basis, and will be addressed in BLM and Forest Service management plans, activity plans, and other local environmental and ecosystem analyses.

Livestock Grazing

Grazing has been an important part of the interior Columbia Basin since the mid-1800s. Until 1905, livestock operators used the public lands on an unregulated basis. Between 1905 and 1934, the Forest Service begin to introduce allotments and grazing systems on lands they administered. From 1934 through 1946, with passage of the Taylor Grazing Act, allotment-based grazing was extended to the rest of the public domain. After World War II, both the Forest Service and BLM begin to make expanded investments in range rehabilitation and management as authorized in the Multiple Use-Sustained Yield Act, the Federal Land Policy and Management Act, and the Public Rangelands Improvement Act of 1978.

Livestock operations are an important part of agriculture in the Project area. Cattle and calf sales account for 29 percent of total agricultural output in the basin as a whole. Table 2-14 presents some relevant facts about the role of agriculture in the nine BEA regions in the entire ICBEMP project area and the Upper Columbia River Basin planning area.

The data in Table 2-14 suggest that dependence on agriculture and on public land forage varies from region to region and county to county. Thus, changes in land management policies that affect stocking rates on Federal

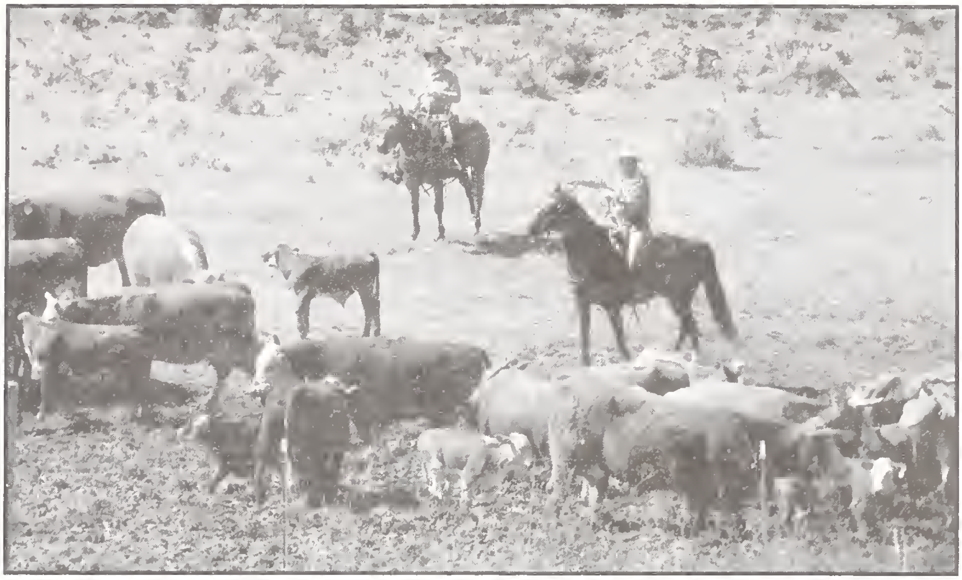


Photo 22: Livestock grazing has been an important part of the interior Columbia Basin since the mid-1800s. Photo by Melanie Miller.

lands, that limit or preclude grazing in certain areas, or that increase the costs of operating on leased or permitted allotments, would have impacts that vary from region to region and county to county, as well. Similarly, the ability of individual ranches to cope with changes in Federal grazing policies and practices would vary depending on the size of the herd, dependence on Federal forage, availability and cost of alternative sources of feed and forage, amount of debt, interest rates on that debt and the percent of household income coming from off-ranch employment or business activity(ies).

The departments of the Interior and of Agriculture expect the number of cattle grazing on public lands to decline by about one percent per year for the next 20 years. Evidence indicates as ranchers grow older, more operators are leaving the profession than are entering it. In some rural areas with population growth, base properties (home ranches) on which herds overwinter are being converted to resort or residential developments or to dairy operations. For sheep, the elimination of the wool subsidy resulted in some marginally profitable operations selling

Table 2-14. Role of Agriculture and Cattle and Calf Sales in Regional Economics of the Project Area.

Trade Regions	Farm/Ranch Income as percent of Total Labor Income	Value of Agricultural Products Sold (millions of 1992 $)	Cattle/Calf Sales as percent of Total Agricultural Output	Dependency on Federal AUMs*
Tri-Cities	12.3	2,196	22.3	1.4
Spokane	3.0	646	14.5	2.5
Missoula	0.7	117	48.1	1.0
Idaho Falls	7.8	852	25.6	11.2
Twin Falls	17.2	962	30.1	6.1
Boise	4.5	1,098	45.4	11.9
Pendleton	9.5	780	30.0	6.6
Redmond-Bend	5.0	388	30.1	9.1
Butte	0.4	57	76.2	2.4
Total UCRB	**6.6**	**7,096**	**28.8**	**7.0**

* Dependency is defined as the portion of total feed consumed by cattle and sheep in an area provided by permitted use of Forest Service and BLM lands. The column displaying dependency on Federal land AUMs understates rancher dependency on Federal grazing permits due to the nature of seasonal grazing systems and the number of cattle in feedlots and dairies that also consume feed and contribute to total cattle/calf sales.

off all of their lambs, rather than retaining female lambs as replacement ewes. These, and other ongoing trends, are acting to reduce the size of herds and flocks operating on the public lands (USDI, USDA 1994).

Total Forest Service and BLM forage use does not wholly represent the reliance of permittees on this forage. Federal forage often is more significant to ranchers than suggested by total supply figures because of their seasonal grazing patterns. It is not the total feed, but the number of livestock feeding part of the year on Federal range that many stress as an important factor. Seasonal use of Forest Service and BLM lands occurs approximately 25 to 30 percent during spring, 24 to 30 percent during summer, 21 to 27 percent during fall, and 2 to 7 percent in during winter (Economics STAR 1996).

Grazing fees for most western public lands administered by the BLM and Forest Service will be $1.35 per animal unit month (AUM) in 1996, down $0.26 from 1995. The formula used for calculating the fee, established by Congress in the 1978 Public Rangeland Improvement Act, has continued under a presidential executive order issued in 1986, in which the grazing fee cannot fall below $1.35 per AUM. The annually adjusted grazing fee, which takes effect every March 1, is computed by using a 1966 base value of $1.23 per AUM, which is then adjusted according to three factors: current private grazing land lease rates, beef cattle prices, and the cost of livestock production. The fee decreased for 1996 because of lower beef cattle prices and higher production costs.

Commercial Timber Harvest and Other Forest Products

Timber supply and demand are determined by the simultaneous interaction of global, national, regional, and local consumers, producers, and land owners. Timber harvest levels in the project area have been declining since the early 1960s as a proportion of the total United States harvest, currently standing at ten percent of total. Combined timber harvests for all owners in the planning area declined by roughly seven percent since 1986 and are expected to decline by another five percent by the end of the decade (1990 RPA). In 1991, timber harvest from Forest Service-administered lands accounted for 34 percent of the total for the UCRB. Timber harvest from forest industry-owned land is larger than from other private lands.

Declining and less predictable Federal timber availability and technological and other changes in the forest products industry have affected people. These effects contribute to decreasing employment opportunities for forest products employment and have also contributed to economic and social hardships in communities with high employment in firms dependent on Federal timber. Declining timber availability has affected people directly through job losses and indirectly through effects on government, with reduced funds for schools and roads. Declining and less predictable Federal timber availability has resulted from: (a) actual reductions of timber caused by declining forest health and (b) the challenges and complexities of meeting current regulations and policies in an ever-changing legal environment, especially in relation to broader issues such as ecosystem health, anadromous fish, and other wide-ranging species of concern. National and regional consequences have resulted from less predictability of resource flows from Federal lands, with effects on the customs and cultures of communities dependent on public-land-based resources.

Local mills can no longer assume they can compete for local timber sales, even when the volume of timber for sale in an area is maintained or increased. As mills west of the Cascade Mountains have reached into eastern parts of Oregon and Washington, and as far as Idaho for timber, unprocessed logs have moved unprecedented distances. The "domino" effect of mills moving east for supply essentially meets a dead end in the upper Columbia River Basin, as the amount of commercial timber available to the east is very little. Sufficient concern led to proposals in 1994 for an "Inland Empire" sustained yield unit that encompassed most National Forests in the upper Columbia River Basin planning area. This proposal would have excluded the participation of timber purchasers from western and central Oregon and Washington in timber sales on National Forests in the upper Columbia River Basin, bringing relief to mills in the upper basin in competing for timber sales in the area.

Figure 2-22 displays annual timber harvest levels in the UCRB for Federal lands and the total.

Special Forest Products

Because of the long history and economic significance of logging and milling, the role of special forest products is sometimes overlooked. However, the collection of forest plants for commercial processing and trade in the project area is a small but growing industry. It is estimated that this infant industry is already producing several hundreds of million dollars per year in product sales. Above three-fifths of this value came from floral greens and Christmas ornamentals. Other significant special forest products include wild edible mushrooms, huckleberries, and medicinals. In this industry, an estimated 70 percent of jobs involve low-paying and seasonal harvesting activities. The other 30 percent of jobs, which are better paying, are in processing and marketing.

The number of permits granted to collect special forest and range products is expected to increase substantially. This will result in the need to manage the resource to assure it remains sustainable. Adjustments to silvicultural practices may be necessary to meet the sunlight and disturbance needs of species that comprise special forest products.

Photo 23: In 1991, timber harvest from Forest Service-administered lands accounted for 34 percent of the total for the UCRB. Photo by Ravi Miro Fry.

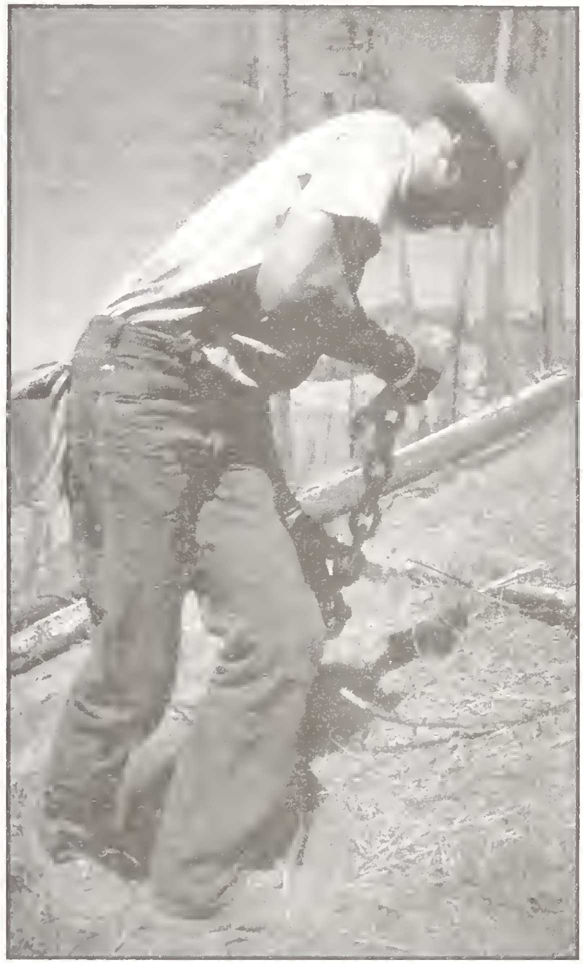
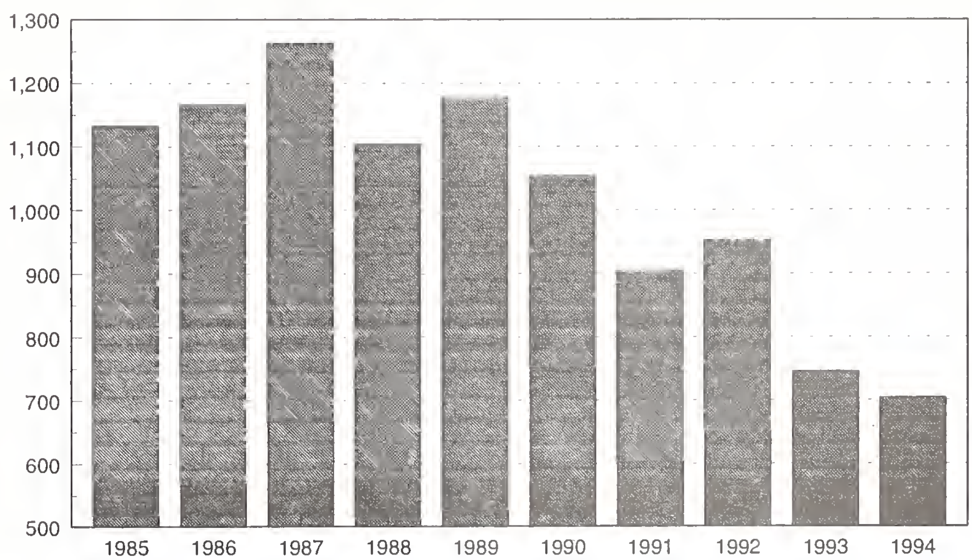


Figure 2-22. Estimated Annual Timber Harvest from Federal Lands in the UCRB Planning Area, 1985 through 1994.



Minerals and Energy

Deposits of gold, silver, and base metals, including copper, lead, and zinc, have for more than a century contributed to the regional economy. Gold placers have been worked in many places within the basin since before pioneer days. Other metals including aluminum, molybdenum, tungsten, nickel, chromium, magnesium, and antimony have played substantial roles in regional and local economies; potential for new discoveries is high. Non-metallic mineral products including phosphate rock, gemstones, and a wide range of construction and industrial minerals have been mined in the basin. Development of coal, oil, natural gas, and geothermal resources in the basin has been locally important. Exploration and development of minerals is authorized principally by the General Mining Law of 1872 for "locatable," primarily hard rock minerals, and the Mineral Leasing Act of 1920 for phosphate rock, and oil and gas. Mineral operations must comply with other Federal laws, including the Clean Water Act.

The value of recent mineral production in Idaho and Montana is shown in Table 2-15. In addition, the portion of the project area in Nevada is in close proximity to the mines which provide Nevada with its leading position in gold production (exceeding $2.4 billion) in 1994. Mining directly contributes one percent of gross State product for Idaho and 6.5 percent for Montana. The mining contribution to overall output in the Interior Columbia Basin was 4.2 percent of the total (Micro IMPLAN for 1990). The majority of this was from nonfuel minerals, with the mineral fuels accounting for less than one quarter of the mining contribution.

Table 2-15. Value of Mineral Production for the Four Principal States in the Upper Columbia River Basin, 1992 through 1994.

	Production ($ million)		
State	1992	1993	1994
Idaho	310	274	343
Montana	539	484	492

Dramatic increases in the value of mining outputs from the late 1970s to the present in Idaho and Montana can be attributed to price increases for metals, notably gold and silver, on world markets. This encouraged expansion of production in these States. Advancement in processing technologies, such as heap leaching of gold and silver ores using cyanide, has made many mineral sites economically viable, and in some areas such as Valley County, Idaho, the technology has led to the creation of mining employment in the past 15 years.

The 100 counties of Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming contain nonfuel minerals valued at $912 million in 1992 (3 percent of total United States mineral

Photo 24: Mining has contributed to the regional economy for more than a century. Photo by USFS/ Boise NF

production value). Twenty of the 100 counties in the region (a few outside the basin) accounted for more than 90 percent of the value in the past decade. The production of metals represented the dominant portion (75 percent), mostly from the production of gold. The metals silver, copper, molybdenum, magnesium, lead, and zinc, and the industrial minerals phosphate and sand and gravel also feature prominently in the region. The top ten minerals-producing counties in the project area are Shoshone (ID), Custer (ID), Caribou (ID), Elko (NV), Owyhee (ID), Stevans (WA), Sliver Bow (MT), Lincoln (MT), Chelan (WA), and Ferry (WA).

While little if any bauxite mining occurs in the project area, aluminum reduction in the project area contributes a significant portion of world and United States production. Aluminum smelters in the interior basin include ALCOA in Wenatchee, Kaiser in Mead, and Columbia Aluminum in Goldendale, Washington; Columbia Falls Aluminum Co. in Columbia Falls, Montana; and Northwest Aluminum in The Dalles, Oregon. These plants have had between 16.7 and 20.6 percent of the U.S. operating capacity available since 1981.

Approximately 11 tons of sand, gravel, and stone are produced per capita in the seven-State region encompassing the Columbia River Basin. Sand, gravel, and stone form the base for infrastructure and other construction. Any economic or population expansion in the region will necessarily be accompanied by expanded demand for these construction materials, resulting in increased production at operating sites and possibly creating the need for developing new sites.

Minerals exploration and production activities now represent a small and declining (on a proportional basis) part of the basin's economy. In 1990, the value of the production of nonfuel minerals represented 4.2 percent of the project area economy. Mining is more significant in the Montana portion of the project area where it represents a higher share of domestic product. One argument mentioned for the decline in mineral exploration and development is that mining and mineral processing in the U.S. are subject to increasingly complex and time-consuming rules under Federal and State laws; as a result, the mining industry is shifting more and more of its exploration and production activities to other nations. Costs include lost opportunities for income and employment, and possible environmental degradation at off-shore sites. Nonetheless, under current Federal law, it is difficult for the Forest Service or the BLM to prohibit mining of locatable minerals on the public lands if the deposit can be profitably produced. Thus, the focus of agency efforts on lands that will be mined is to prevent unnecessary and undue degradation and to assure reclamation of disturbed lands.

Utility Corridors

BLM- and Forest Service-administered lands in the interior Columbia River Basin contain thousands of linear miles where lands serve as transportation and utility corridors, including State and Federal highways, county roads, electric power lines, natural gas pipelines, and other infrastructure which link human communities in the region. Hydroelectric facilities on Federal lands are licensed pursuant to the Federal Power Act of 1920. Designation of "Scenic Byways" on BLM- and Forest Service-administered lands was recognized in the Intermodal Surface Transportation Efficiency Act of 1991. Designation of utility corridors through land-use plans was included in the Federal Land Policy and Management Act (FLPMA) of 1976.

Utility corridors (electric, pipeline, and communications) connect generation sources (such as hydroelectric dams) with customers. Regulations require the consideration of designating corridors in the land-use planning process. The designation of utility corridors through land-use plans can help minimize the proliferation of such rights-of-way that might occur if there were no planning. Congress recognized environmental and socio-economic concerns in the 1970s, at a time of rapid growth in energy development in the western United States, and authorized both the Forest Service and the BLM to issue regulations for lands they administer. In the Columbia River Basin, corridors associated with the development of the region's hydropower system have affected a substantial amount of land. Maintenance of the existing infrastructure, including reducing hazards from vegetation growth, requires access in order to maintain utility services. In addition to the existing corridors in use, other corridors have been designated for possible future expansion when warranted.

Road System

A discussion of the road system currently in place on National Forest- or BLM-administered lands is needed because road access is important to many users, supports the bulk of economic activity generated from agency lands, and represents a substantial public investment. This discussion describes the amount and type of roads on agency lands, construction and maintenance costs for the road system, and the human uses and values attributed to unroaded areas.

Road Inventory

The inventoried road system on Forest Service- or BLM-administered land in the project area includes approximately 91,300 miles of roads, 90 percent of which are on National Forest System lands. Most of the existing road system, some 63,000 miles, are in eastern Oregon and Washington National Forests, leaving approximately 24 percent of the road system in the UCRB. A large proportion of the roads serves high clearance vehicles (roads designed and maintained to a low standard), leaving less than 20 percent of roads for passenger vehicles (roads designed and maintained to a high standard). Low standard roads provide for most land and resource management and protection needs, and they also provide dispersed, roaded recreation. The remaining high standard roads serve both management and concentrated recreation use. It is estimated that up to 33 percent of the low standard roads are closed to the public by gates or earth barriers for all or most of the year.

Construction and Maintenance Costs

Roads represent a considerable public investment to facilitate use of Forest Service- or BLM-administered lands. Roads are tangible physical and financial assets that represent a substantial commitment of land and capital. The operation of this large road system is expensive, as shown by the following Forest Service-derived costs. Roads in the UCRB planning area typically cost from $10,000 to $150,000 per mile to construct and $100 to $1,600 per mile to maintain, depending on the topography and type of road built. Based on current construction costs, the road system would cost approximately $1.75 billion to build today. Historically, commercial timber harvest paid for 90 percent of construction costs and 70 percent of maintenance costs. The rest was paid for by congressional appropriations. In the absence of commercial use, maintaining the existing road system would continue to cost an estimated $10 million annually. Maintenance costs are highest for high standard roads at $550 per mile (Abernathy 1996). In addition to out-of-pocket costs, roads eliminate or reduce the productive capacity of those acres committed to the road prism and waste areas.

Currently in the Pacific Northwest, National Forests are approximately 30 to 50 percent short of funds for maintenance of the current road system to existing standards. Construction and reconstruction funds have decreased from about $200 million in 1980 to $25 million in 1995. This reflects both lower appropriated funding as well as declines associated with purchaser credits from timber sales (which declined from 5.2 billion board feet in 1980 to less than 1 billion in 1995). Use of the transportation system on Pacific Northwest National Forests has changed over the last decade. In the 1980s, system usage was approximately 70 percent timber harvest, 20 percent recreation, and 10 percent administrative traffic; since the reduction in timber sale programs, this has shifted to 35 percent timber, 60 percent recreation, and 5 percent administrative traffic (Kozlow 1995).

Roads have enabled almost all of the economic activity generated by Federal lands in the UCRB planning area, and will continue to be important in this respect. Roads also supply or enable the majority of recreation use, including winter recreation. However, increasing scarcity of unroaded areas and appreciation for unroaded benefits puts substantial, if intangible, value on unroaded lands. Benefits of unroaded areas can include high quality water, habitat for wildlife and fish, ecosystems with limited human disturbance, scenery, and primitive recreation. The extent of road development is critical for determining whether an area is considered for wilderness or similar designation. Building roads in areas previously valued for their unroaded condition generates a cost for lost opportunity, in addition to added benefits associated with automobile access. Looking to restore or protect certain environmental conditions, road management options now include various degrees of road closures, lower maintenance levels, and full road obliteration. This "disinvestment"

approach is also a logical response to reduced road maintenance funding that can be expected if commercial use decreases. Costs of this strategy include the cost of closing and obliterating roads, short-term environmental costs, and lost access to managers and the public. The total cost of lost access depends on miles of roads lost, road maintenance class, and location.

Fire and Fuels Management

The Organic Act of 1897 applying to Federal forest reserves directed that the ". . . Secretary of Agriculture shall make provisions for the protection against destruction by fire and depredations upon the public forests and national forests . ." making abundantly clear the Government's policy to suppress wildfires. The 1910 fire in northern Idaho and western Montana reinforced the policy to control wildfire, and additional congressional laws like the Weeks Law in 1911 and the Clarke-McNary Act in 1924 authorized fire protection in a cooperative manner with other land owners. In response, fire suppression on National Forests was actively implemented for several decades. Areas that may have otherwise burned without active suppression have had fire excluded. Records show low amounts of acreage burned in UCRB through the middle part of this century, with an increasing and noticeable trend in increased fire size in the past ten years.

Along with the significant upward trend in the number of acres of forest land burned, as discussed in the Forestland section of this chapter and shown in figure 2-23, the Federal agencies have incurred large costs in fire suppression, as well as post-fire rehabilitation costs. Fire suppression costs on National Forests in the UCRB for fiscal year 1994 were a record 250 million dollars, surpassing the previous record in 1992.

Detailed information kept on fire suppression costs since 1989 shows that the costs of fire suppression of forest fires are higher on a per-acre basis than for range fires. Suppression costs increase overall with the size of fire, even though suppression costs on a per-acre basis decline with the size of fire due to the large costs of mobilization and initial suppression efforts. Despite the increased efficiency in suppressing larger fires, initial attack and mobilization efforts are cost-effective in the long

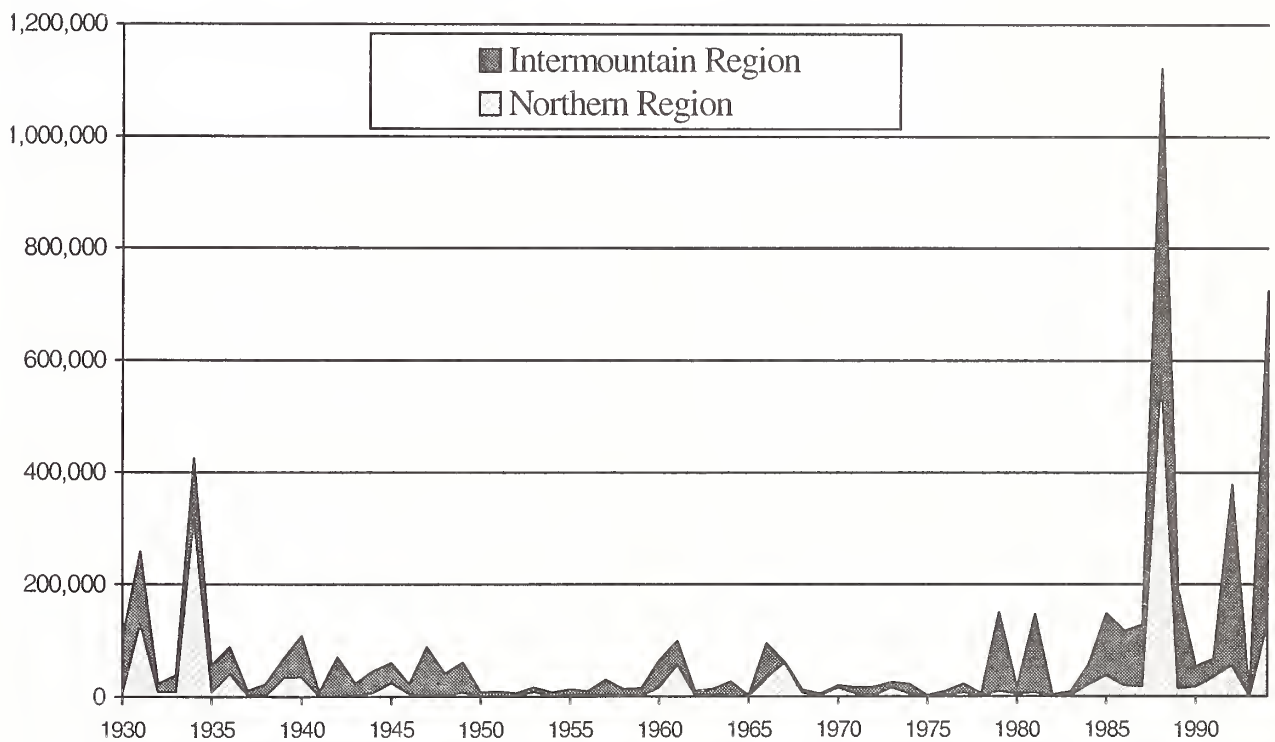


Figure 2-23. Wildfire acreage in forest Service Northern and Intermountain Regions: 1930 through 1994.

Photo 25a

Federal agencies have incurred large costs in fire suppression, as well as post-fire rehabilitation costs. Photos by Ravi Miro Fry (A) and Karen Wattenmaker (B).

Photo 25 b

run because total fire size still leads to overall higher costs. Additionally, initial attack efforts are necessary for fires that start in or near a wildland-urban interface. In contrast, large range fires achieve their final size in a fairly short period of time, generally only a few days. Duration of suppression activities for a large range fire is much less than for a forest fire of equivalent size.

Economic effects of fires and fire suppression activities include benefits to seasonal fire fighting employees and to contractors who supply fire fighting and support services to the Federal agencies. In larger fires, locally affected communities may experience a temporary increase in retail business due to the presence of fire fighters. Local areas may also experience negative consequences during and after fires because local public lands may be closed to livestock grazing, recreation and hunting. Federal agency outlays for fire suppression equipment and services often do not accrue to a local area because contractors which supply Federal fire suppression efforts are not necessarily associated with the fire location.

With larger fires, Federal agencies often must temporarily reallocate staff to fire suppression and recovery efforts, away from other programs. Resources lost or negatively affected by severe fires (watersheds, fisheries, wildlife, scenery, timber, forage) represent another economic and social cost to society from fires. Efforts to salvage burned timber must occur in a short time in order to extract the value. Low intensity surface fires, on the other hand, may actually provide economic and social benefits

beyond the short-term impacts such as additional forage for wildlife and reduction of fuels that can contribute to stand-replacing fires.

Given the recent trends in fire activity, future costs for fire suppression can be expected to maintain their high level, or even increase under adverse conditions in dry years. A recent Forest Service study on fire suppression costs on large fires found that, even after accounting for inflation, agency expenditures are increasing. Nationwide, emergency fire suppression costs are expected to rise by $20 million annually in order to fund annual Forest Service emergency suppression expenditures each year into the future (Truesdale et. al. 1995). Actions that reduce fuels through prescribed burning, thinning and commercial timber harvest may change the prospects for future uncharacteristic fires and these expected increases in emergency fire suppression costs.

Local, Regional, and National Use

A discussion of the different kinds of economic contributions that National Forest- or BLM-administered lands provide society is important because land-use choices will benefit people differently. Recognition of these differences is important for achieving economic and social goals.

Generating Wealth versus Generating Value

There is a difference between valuing Forest Service- or BLM-administered lands based on how they serve national demands versus economic contributions they make locally. The economic value and societal importance of these lands continues to increase as use increases, and as the unique attributes they provide become more scarce. However, this increased value does not necessarily generate local income or funds to support local government investments in infrastructure or social services. Much of the value is captured by those living elsewhere, who either travel to Federal lands to recreate, use water downstream from Federal lands, catch fish spawned in federally managed streams, or benefit from the protection of important federally managed ecosystems. A complete accounting of economic benefits would include value obtained by people who may not ever visit the project area, but who benefit from knowing it exists now and in the future. Often referred to as existence or preservation values (Duffield 1994), these indirect benefits can range from 3 to 20 times greater than benefits flowing from direct use of a resource. The magnitude of the numbers are subject to dispute, but there is no question that project area resources have national value aside from their role in the marketplace.

Traditional commodity uses of Forest Service- or BLM-administered lands have favored local use and generated local income. Uses that are growing in importance favor regional and national users and generate benefits accordingly. This can be interpreted as a shift of Forest Service- or BLM-administered lands from being primarily local and regional assets to being national assets. While these lands have always been national assets by definition, the actual use and way the lands are valued increasingly reflect this.

Payments to Local Government

The Forest Service and BLM make payments to local governments to compensate them for the non-taxable status of the Federal lands in their jurisdiction. The formulas used to calculate the amount of money received varies by agency and product. Generally there is a "per acre" payment associated with county population (PILT, payments in lieu of taxes) plus an additional "revenue-sharing" amount available if revenues exceed a certain threshold. While the PILT payment is fixed, the extra money from revenue sharing is important to some counties. Potential reductions in these payments caused by changes in agency land uses are a concern to county governments accustomed to this revenue. For counties within the jurisdiction of the Northwest Forest Plan (Oregon, Washington, California), Congress has legislated special appropriations to partially offset revenue losses steming from reductions in agency timber sale receipts.

The governments of rural communities may be relatively unprepared to deal with the kinds of changes that might result from fundamental shifts in Federal land management policies. Rural governments are mostly part-time governments. For example, in the State of Idaho, there are 199 incorporated cities, 179 of

which (90 percent) have populations below 5,000 persons. Of these 179 communities, only 7 have full-time city administrators. Many municipalities with populations under 5,000 have a city clerk as their only full-time employee. Mayors and city council members in the typical rural community receive little to no pay. Budgets are small and discretionary dollars are non-existent. These attributes of smaller, rural communities may make it difficult for them to withstand complex changes. This can lead local governments to rely more heavily for technical and financial assistance from higher levels of government (Harris, Brown and McLaughlin 1995), which may limit local initiative, autonomy and creativity, and create a predominant role for interest groups in the policy process.

Economic Importance of Agency Timber and Forage to Counties

Relating the use of agency lands to economic conditions locally (the county or community level) is important to the public and to government entities. While economic systems operate over much larger areas, agency economic and social policy generally focuses on communities. The "timber and forage importance index" presented in table 2-16 provides a partial but useful picture of the historical relationships between agency land uses and local economic activity.

Overview of Employment

A discussion of the contribution that agency lands make to economic growth and employment is important because they are affected by agency land use choices and are key elements of major public issues.

Regional Employment Status

The economy of the project area has undergone substantial change over the past three decades (table 2-17). In terms of job formation, the project area has grown much faster than the nation as a whole. Total jobs have increased even during periods when employment in manufacturing (other than instruments and electronics), mining, logging, farming, and ranching was either stagnant, falling, or moving erratically (Rasker 1995). Employment in service industries has increased significantly in that the number of households receiving "nonlabor income" (income from transfer payments, dividends, interests, and rents) has grown. Increases in service employment includes gains in recreation and tourism plus gains in business, education, management, and engineering services generated by new residents that moved to the area for its amenities and small town character. Evidence of this change is shown in part by the 61 percent of the job growth since 1969 in services, retail sales, and finance, insurance and real estate. Rapid employment growth is also found in advanced technology, retail trade, transportation services, and construction.

Much of this economic growth has been centered in metropolitan counties and counties experiencing rapid population growth. Analyses which focus exclusively at regional levels, such as Rasker (1995), Niemi and Whitelaw (1995), and Power (1996), however, only tell part of the story. By focusing on the region as a whole, studies can overlook the significant differences between large cities and small rural communities in the region (Harris, Brown and McLaughlin 1995), and even between small communities (Robison, McKetta and Peterson 1996) most affected by Federal land management policies. In principle, both regional and local information is important.

Employment Associated with Forest Service- or BLM-administered Lands

Direct employment generated from Forest Service- or BLM-administered lands falls mostly into job categories such as manufacturing (especially wood products), agriculture (especially livestock grazing), agricultural services (including forestry services), mining, and Federal employment. Another important employment sector affected by agency land use is recreation and tourism, an industry not directly measured by employment data. Together, these employment categories are the ones most likely to be measured as an effect of changing agency land uses. Currently, over 220,000 jobs are associated with livestock

Table 2-16. Factors Used to Score Timber/Forage Importance Index for Upper Columbia River Basin

County	% Federal Land[1]	% Timber from National Forests[2]	% Forage from Federal Land[3]	% Population Change (80-92)[4]	% Nat Resource Employment[1]	Economic Diversity[5]	% Federal Payments[6]	Importance Rating
Idaho								
Ada	46	71	1	29	3	High	.3	Low
Adams	65	71	24	6	20	Low	29	High
Bannock	33	N/A	6	5	3	Medium	.6	Low
Benewah	10	18	1	-2	7	Low	2.6	Medium
Bingham	29	N/A	3	7	12	Low	.6	Medium
Blaine	76	N/A	14	51	8	Medium	5.7	Low
Boise	77	71	17	35	12	Low	36	High
Bonner	45	45	1	3	5	High	6.3	Medium
Bonneville	54	N/A	8	17	4	Medium	.7	Low
Boundary	61	45	1	19	12	Medium	17.3	High
Butte	86	N/A	20	-12	19	Low	10	High
Camas	65	N/A	39	-8	23	Low	12	High
Canyon	6	71	0	15	10	High	.08	Low
Caribou	40	N/A	15	-18	20	Low	9	
Cassia	56	N/A	9	4	22	Medium	6	
Clark	66	N/A	34	0	34	Low	10.5	High
Clearwater	59	33	4	-17	9	Low	16.4	High
Custer	93	N/A	36	20	23	Low	21	High
Elmore	73	N/A	9	-5	10	Low	35.6	Medium
Fremont	60	75	11	4	21	Low	7	High
Gem	38	71	3	5	16	Medium	4	
Gooding	53	N/A	1	1	29	Medium	4.2	
Idaho	83	65	6	-4	16	Medium	44.4	High
Jefferson	53	N/A	1	14	15	Low	2.4	
Jerome	26	N/A	1	4	22	Medium	2	
Kootenai	32	37	1	30	5	High	3	Low
Latah	17	19	8	11	7	Low	5.3	Low
Lemhi	91	75	17	-5	17	Medium	19.2	High
Lewis	3	33	.5	-18	16	Low		Medium
Lincoln	75	N/A	4	0	20	Low	8	Medium
Madison	20	75	2	23	12	Low	.6	Low
Minidoka	36	N/A	1	2	17	Low	2.2	
Nez Perce	4	19	0	5	5	High	.2	Medium
Oneida	53	N/A	16		21	Low	3.6	

Table 2-16. Factors Used to Score Timber/Forage Importance Index for Upper Columbia River Basin (continued).

County	% Federal Land[1]	% Timber from National Forests[2]	% Forage from Federal Land[3]	% Population Change (80-92)[4]	% Nat Resource Employment[1]	Economic Diversity[5]	% Federal Payments[6]	Importance Rating
Owyhee	76	N/A	23	3	40	Low	6	High
Payette	26	N/A	1	10	10	Medium	.7	
Power	34	N/A	4	10	25	Low		
Shoshone	75	45	12	-29	28	Low	36.7	High
Teton	33	N/A	4	33	24	Low	3.6	
Twin Falls	52	N/A	8	6	12	High		Medium
Valley	88	71	17	24	8	Medium	38.7	Medium
Washington	37	N/A	7	-1	19	Medium	6	
Montana								
Deer Lodge	39	N/A	2	-20	6	Low	.8	
Flathead	74	47	1	21	4	High	1.6	
Granite	64	14	4	-6	20	Low	3.6	High
Lake	18	14	0	16	10	Medium	.5	
Lewis and Clark	48	23	1	15	4	Medium	1.2	
Lincoln	76	N/A	17	0	9	Medium	9.4	High
Mineral	83	69	3	-6	10	Low	4.2	High
Missoula	43	14	1	8	4	High	.6	Low
Powell	49	66	1	-2	13	Low	4.4	High
Ravalli	73	66	1	22	9	Low	3	High
Sanders	52	69	0	2	13	Medium	4.2	Medium
Silver Bow	52	66	10	-10	8	Low	.4	High
Elko, Nevada	??	N/A	38	16		Low		
Humbolt, Nevada	??	N/A	38			Low		
Teton, Wyoming	??	N/A	24	31		Low		

Sources: [1]Percent Federal Lands. Source: Machlis, G. et al. 1995.
[2]Percent Timber from NFS. Sources: Keegan, C.E.; et al. 1990; Keegan, C.E., et al., 1992.
[3]Percent Forage from Federal Land. Source: Frewing-Runyon, 1995
[4]Percent Population Change (80-92). Source: EA REIS CDROM
[5]Shannon Weaver Diversity Index using employment data. Source: Greg Alward and IMPLAN database.
[6]Percent Federal Payments. Sources: Williams, 1995; Schmit 1996.

Table 2-17. Employment By Industry in the Project Area.

Item	1969	1992	% Change
Total Employment	908,954	1,619,923	78.2
Farm & Ranch Employment	120,504	112,264	-6.8
Nonfarm Employment	788,450	1,507,659	91.2
Agriculture Services, Forestry, Fisheries & Other	9,308	35,208	278.3
Mining	8,590	10,372	20.7
Construction	42,243	81,929	93.9
Manufacturing	119,703	176,067	47.1
Transportation, Communications & Utilities	44,931	67,304	49.8
Wholesale Trade	38,110	72,826	91.1
Retail Trade	141,661	279,555	97.3
Finance, Insurance & Real Estate	51,879	90,684	74.8
Services	153,587	411,911	168.2
Federal Civilian	29,178	37,965	30.1
Military	28,188	25,391	-9.9
State & Local	116,924	206,629	76.7

Source: Bureau of Economic Analysis, Regional Economic Information System (CDROM)

grazing, recreation, and timber harvest on lands administered by the Forest Service or BLM. It was estimated that recreation accounts for 87 percent of these jobs, timber harvest for 12 percent, and livestock grazing for one percent (Economic STAR 1996).

Manufacturing

Manufacturing is important to discuss because wood products manufacturing, a job category closely tied to agency timber harvest, falls into this category. It is also still perceived by many to dictate the economic health of the overall regional economy, though this view no longer fits. The reduced regional importance of wood products manufacturing is due more to rapid growth in other sectors of the economy than to decline in the wood products industry. Wood products manufacturing employment is still locally important to some places in the UCRB planning area.

Manufacturing jobs in total make up a smaller percent of total employment in the planning area than nationally, suggesting that the area is not comparatively strong in manufacturing. This is not the case for wood products manufacturing (one component of the manufacturing sector), where all BEA regions covering the planning area have wood products employment above national levels. The highest percentage is found in the Missoula BEA region at five percent, while the lowest in the UCRB are the Twin Falls and Idaho Falls BEA regions both at 0.5 percent. The national level is also approximately 0.5 percent. Since 1982 timber industry employment for the UCRB (Idaho and Montana) has ranged from 18,500 to 22,000 jobs (Haynes 1995). Timber industry employment peaked in 1978 in the UCRB at 28,000 jobs. Reductions in employment were due to several factors, including legally imposed reductions on Federal timber sales, the recession of 1990, technological improvements, and changes in the mix of products manufactured by the region's timber industry. Changes in milling technology and competitive product marketing are longer-run forces gradually reducing the industry's employment.

The view of future timber-related employment in the project area is thus somewhat unclear. If the salvage program approaches the harvest objective set for it by Congress, timber employment may rise. In the near future, declining harvests in the project area and ongoing reductions in the number of workers needed as new technologies

substitute capital for labor can be expected to continue a trend first evident in the 1970s and 1980s (Brunelle 1990) leading to a decreased timber employment. Over the longer term (20 to 50 years), timber employment is expected to stabilize and then increase as harvest levels rise in response to the demand of the increasing U.S. and worldwide human population for housing and business construction.

Not reported in the Economic Assessment is the pulp and paper manufacturing sector, which is also sensitive to forest products harvest from BLM- or Forest Service-administered lands. Major employment centers are in Lewiston, Idaho, and Missoula, Montana. While only a small percentage of harvested timber is directly consumed by pulp plants, a significant amount of mill residue from sawmills and plywood plants are routed to pulp manufacturing facilities in the UCRB, resulting in over 40 percent of the volume of timber products harvested in Idaho and Montana constituting raw material for pulp, paper, and board products. Pulp and paper mills outside the UCRB also use forest products from the area. Pulp plants are therefore likely to be affected by changes in available saw timber from Federal lands, as well as potentially available timber from thinning activities that, because of species composition or diameter, are not of saw timber quality.

Agricultural Services and Farm Employment

Unlike the manufacturing group, the agricultural services group has a higher percent of total employment in the planning area than nationally (2.5 percent versus 1.1 percent), showing the comparative economic importance of this employment in the planning area. Individually, all BEA regions except the Spokane BEA region show an employment percentage greater than national levels. The highest percent employment in agricultural services for the UCRB is the Twin Falls BEA Region at 4.7 percent of total. Farm employment for the project and planning areas is greater than nationally. Project area-wide farm employment is 7.8 percent compared to national farm employment of 2.2 percent. Farm employment in the Twin Falls BEA Region is at 14 percent, while in the Idaho Falls BEA Region it is at 7.3 percent, and in the Boise BEA region is at six percent.

Mineral Resources

The mineral industry generally provides less employment in the planning area than nationally. The Spokane region, where mining contributes 0.61 percent, still less than the 0.66 percent nationally, but more than the project area-wide level of 0.45 percent. Highest in the UCRB is the Butte BEA Region at 1.47 percent of total, followed by the Idaho Falls BEA Region at 0.83 percent of total.

Recreation

Recreation-based employment, while not directly measured by the Bureau of Economic Analysis, is estimated to generate approximately 15 percent of employment in the planning area (Economics STAR 1996). Recreation employment must be estimated from the proportion of other industry group employment that supports recreation, for example, amusement, retail, lodging, eating and drinking, and gas stations.

Project area-wide recreation supports an estimated 190,000 jobs. Hunting supported the greatest number of jobs (49,000), followed by driving for pleasure (40,000), and day use (34,000). A regional economic study conducted by the Forest Service in the central Rocky Mountains recognized the export nature of some tourist-related service industries. The effect of these service/tourist industries on the local economy was found to be similar to the earnings returned to a local firm from the export of physical commodities (DeVilbiss 1992).

Information on the distribution of economic effects of recreation-related spending in the basin in limited. Quinn (1985) found on the Boise National Forest that recreation-related expenditures occur primarily in the Boise area (where most of the recreationists reside), and that economic effects in the rural communities surrounding the Boise National Forest were modest. Robison and Freitag (1994) concluded that existing approaches to estimating forest recreation economic impacts may exaggerate economic benefits of recreation in rural communities.

Most of the basin is occupied by one or more ungulate species such as elk and mule deer, which are important both for social reasons (recreational hunting and viewing), and for economic returns to local communities through

expenditures during hunting seasons. For example, approximately 450,000 hunters pursue elk annually within the basin and in 1991 were estimated to have spent $111 million, yielding a total economic effect of about $225 million and 3,467 jobs. Although the permit numbers may be limited for some other ungulate species such as mountain goat or bighorn sheep, the public, at least some individuals or corporations, are willing to pay up to $300,000 for the opportunity to harvest a single bighorn sheep. Viewing ungulates is also important to many people.

Forest Service and BLM Employment

Federal employment associated with Forest Service or BLM administration of public lands can be important locally, both in terms of job numbers and wages per job. This importance results from agency policy, particularly with the Forest Service, to locate administrative units in small, rural communities. The estimated 9,000 to 10,000 jobs in the project area may not be substantial regionally, but 250 jobs in Salmon, Idaho, or 120 in Darby, Montana, are very important to the vitality of these rural communities.

In addition to contributing to local governmental revenues or economic activity in rural counties in the ways discussed above, both the BLM and the Forest Service have programs which result in direct spending within their jurisdictional areas. This spending by the agencies contributes to economic activity in rural settings. For example, the BLM and the Forest Service annually spend an average of $3.99 per animal unit month of forage grazed by livestock on lands they administer. There are an estimated three million AUMs of Federal forage permitted by the two agencies in the project area. Thus, by extension, the two agencies are generating an estimated $12 million per year in economic activity in the project area and in national (Washington, D.C.) and regional offices through their spending on rangeland programs. The two agencies also spend considerable amounts annually on their recreation, timber, fire management, and minerals programs (estimates of this spending were not developed for this EIS). Wages and salaries of Federal employees stationed in rural communities in the region, and purchases of goods and services from local businesses to support the offices, also contribute to local economies.

Employment and Income

Economic activity can be measured by number of jobs or by income (choices being per capita income, personal income, and household income). Income is generally more difficult to measure than employment. Recognizing that wages differ by job type, it is often noted that the types of jobs created or lost might be more important than the number of jobs. The generation or protection of "family wage jobs" in a community is often stated to be important.

One way to examine the importance of Forest Service- or BLM-administered land uses to local income is to compare the industries most likely to be directly affected by Federal land management choices with the industries that contribute the highest total wages and wages per job. For the top five wage jobs in six eastern Oregon counties having important ties to lands administered by the agencies, lumber and woods products manufacturing and Federal Government employment are the most frequently occurring high wage jobs (Oregon Employment Department). Wood products manufacturing and Federal government employment also show up in the top five for total income (wage per job times the number of jobs). Most other high wage and high total income job categories for these counties are not directly tied to lands administered by the agencies. Frequent top five finishers for "per job" wages include utilities, local and State government, communications, heavy construction, and trucking. Frequent top five finishers for total income include State and local government, utilities, health services, and automobile related industries.

Recreation, a recognized growth industry tied to Forest Service- and BLM-administered lands in the project area, illustrates a different story told by employment versus income. An estimated 15 percent of employment in the project area is supported by recreation—more than either wood products manufacturing or mining (Economics STAR 1996). However, many service industries supported by recreation activity, such as amusement, retail, lodging, eating and drinking, gas stations, and others, generally experience lower wages than manufacturing, mining, forestry and Federal employment, the other employment sectors closely tied to land uses of the agencies (Oregon Employment Department). In fact, the

Economic Assessment reported the total value in recreation willingness-to-pay at roughly $1.1 billion, and that recreation-related employment in the project area at 190,000 jobs. Assuming that the willingness-to-pay translates to wages and salaries, each job has a value of $5,800, well below the per capita income for the region.

Counties strong in manufacturing jobs earn high wages but experience a lower per capita income than counties strong in other job categories (McGinnis and Horne 1995). This suggests that manufacturing jobs are supporting more single-income households than other job categories, a factor related to labor force participation rates, age and family structures, and commuting patterns (Economics STAR 1996).

Population and Income Change by Trading Area

Data developed for the project suggest that economic and social factors differ in character at the county level based on the settings within the basin. Specifically, between 1980 and 1990, settings that were highly dependent on government programs and/or mining performed below average in terms of retaining jobs and population. Rural counties with a great deal of natural or naturally appearing landscape(s) experienced above average job and population growth performance as did urban and metropolitan areas with diversified economies—especially ones with strong high technology and business, engineering, medical or educational services components. Settings dependent on timber, farming, and ranching finished in the middle, growing more than mining- and government-dependent areas but less than high amenity rural locations or settings with diversified economies. To illustrate this relationship, the UCRB was divided into six regions (map 2-29). These regions vary in terms of their dependence on differing industries and/or are diversified to varying degrees.

The 10 counties north of the Salmon River and part of the Spokane BEA Region are heavily dependent on timber, but recreation, tourism, and retirement are a growing force in the economy of the area. The region as a whole posted a modest increase in population between 1980 and 1992 (+7.5 percent). However, substantially all that growth occurred in two very scenic and rapidly diversifying counties, Kootenai (+30 percent) and Boundary (+19 percent), where recreation-related employment and retirement migration are stimulating growth, and in Latah county (+11 percent), home to the University of Idaho. In this region, half of the counties lost population between 1980 and 1990. However, in a partial reversal of fortune, 80 percent of the counties in this region recorded population increases between 1990 and 1992.

The Boise BEA Region (ten counties in southwest Idaho) is the most diversified. It is the only region with a metropolitan area (Ada and Canyon Counties). In addition, high technology (electronic and instrument) manufacturing and business, educational, engineering and management services are significant and growing components of the region's economy. This diverse setting was the fastest growing UCRB region from 1980 to 1992, with a 21.8 percent increase in population. Likewise, 60 percent of its counties gained population between 1980 and 1990, and 90 percent saw growth between 1990 and 1992. The one county that didn't grow from 1990 to 1992 was the one most dependent on government.

The Twin Falls BEA Region (seven south central Idaho counties and Elko County, Nevada) is diverse in another way. It includes a strong travel and recreation component (Sun Valley at its north end is a world-class resort and Elko, Nevada, to the south is a major casino/night club leisure destination). Its farm and ranch economy has also matured with the addition of a number of food processing, dairy, cheese, and feedlot operations. This diverse region grew in population by 19.9 percent from 1980 to 1992. Additionally, 50 percent of its counties recorded population increases between 1980 and 1990, and all of them grew between 1990 and 1992.

The Idaho Falls BEA Region (13 eastern Idaho counties) is highly dependent on farming, food processing, and government. However, it also is home to the Idaho National Engineering Laboratory, one of the largest facilities of the Department of Energy. It also includes one major public and one large private institution of higher education (Idaho State University in Pocatello and Ricks College in Rexburg). It includes two large trade centers (Pocatello and Idaho Falls), is the Idaho gateway to Yellowstone and Teton National Parks, and has several communities with tourist-based economies (Jackson Hole, Wyoming, and

Map 2-29. Economic Subregions of the Upper Columbia River Basin

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Draft UCRB EIS
1996

Major Rivers

Major Roads

EIS Area Border

Trade Center(s) shown for each Economic Subregion (shaded in gray).

Stanley and Lava Hot Springs, Idaho). This region grew in population by 10.8 percent from 1980 to 1992. During that decade, 71 percent of the counties in this region recorded population increases. Likewise, 93 percent of the counties in the region had growing populations between 1990 and 1992.

The Missoula BEA Region (7 counties in northwest Montana) is heavily dependent on timber and government. It posted a population increase between 1980 and 1992 of 12.6 percent. However, nearly 70 percent of that growth occurred in the very scenic and rapidly diversifying Flathead and Missoula Counties (where recreation-related employment and retirement migration are stimulating growth). In this region, 57 percent of the counties gained population between 1980 and 1990. All counties in this region recorded population increases between 1990 and 1992.

The five counties making up the Butte/Helena BEA Region one highly dependent on government. It is the only region which lost population between 1980 and 1992. (Additionally, 80 percent of the counties in that region lost population from 1980 to 1990, and 40 percent lost population from 1990 to 1992.)

Economic Character of UCRB Counties and Communities

While the regional scope of this analysis does not permit presentation of information on every individual community, it is possible to extrapolate from existing data to understand where communities might be found that are dependent on timber, mining, ranching, and travel and retirement (Harris et al. 1995).

Communities dependent or reliant on timber industry activities are most likely to be found in the Spokane and Missoula BEA Regions (which are, respectively, 21 and 11 percent dependent on forestry for earned income). However, a number of timber-dependent communities are also likely to be present in Adams, Boise, Gem, and Valley Counties in the Boise BEA Region and in Granite and Powell Counties in the Butte BEA Region.

Mining dependent and/or reliant communities are most likely to be found in Caribou, Custer, Shoshone, and Power Counties in Idaho; Elko County, Nevada; and Lincoln and Silver Bow Counties in Montana.

Tourism, recreation and retirement growth communities are most likely to be found in Bonner, Idaho, Kootenai, Latah and Nez Perce Counties in the Spokane BEA Region; Valley County in the Boise BEA Region; Blaine (ID) and Elko (NV) Counties in the Twin Falls Region; Madison (ID) and Teton (WY) in the Idaho Falls BEA Region; Flathead and Missoula Counties in the Missoula BEA Region; and Lewis and Clark County in the Butte BEA Region.

The BEA Regions most likely to include ranching communities are Boise, Twin Falls, and Idaho Falls. These three regions accounted for 90 percent of the cattle and calf sales in the upper Columbia River Basin in 1992. These three regions are also home to 75 percent of the working ranches that graze their herds or flocks on public lands. Within these three regions, Owyhee, Washington, Adams, Gem, Cassia, Twin Falls, Blaine, Gooding, Lincoln, Lemhi, Custer, Bingham, Jefferson, Butte, Bonneville, Power, and Fremont Counties in Idaho, and Elko County in Nevada are most likely to have public land ranching-dependent communities. While it lies in a region where only three percent of earned income comes from farming and ranching, Idaho County is also likely to have several communities that depend on public lands livestock operations.

Communities

The well-being of rural communities economically or socially connected to Forest Service- or BLM-administered lands has been an important, perhaps dominant, factor driving the social policy of these agencies. Given this, an understanding of the relationship between past agency social policy, land-use choices, and rural communities is an important component of the affected environment. Concern about the future of rural communities, especially those with high employment in industries that rely on management of resources on Forest Service- and BLM-administered lands, was reflected by a congressional hearing in Grangeville, Idaho (July 5, 1995), where the subcommittee discussed its concerns about "Endangered Communities."

Communities

The term community has several definitions. Communities can be groups of like-minded people who gain strength from their relationships and associations. Communities of interest are people employed in a similar profession, people who participate in the same activities, or those who share a set of values ~ for example, the "ranching community" or the "environmental community." As used in this chapter, the term community has a more traditional definition: spatially-defined places such as towns. This is an important scale because the community is where people socialize, work, shop, and raise their children. It is often the focus of their social lives. Counties are an important political scale to consider, but leaving the discussion at that level would mask many differences among communities within a given county.

The Bureau of Census recognizes 476 communities within the project area, including 29 cities with more than 10,000 people and 49 Census-Designated Places—locations that are unincorporated but have an identity to the local population. Of the other 398 small rural communities, 68 percent are communities of 1,500 or fewer people, which is the smallest size class. These range from 22 to 1,500 people, with an average population of 520.

For the Interior Columbia Basin Ecosystem Management Project, many types of information about communities in the project area were collected. Harris (1995) contains a complete description of this information, which included Community Self-Assessments—interviews with 1,350 community leaders and residents in nearly half (198 out of 476) of the project area's communities. Profiles of the economic structure of each community were developed (Robison, as cited in Harris 1995). These will be a valuable source of information for the Forest Service and BLM to use in future planning, and for communities themselves.

Conventional Notions of Community Stability

The concept of stability, in reference to both economic and community stability, has long been the dominant theme of social and economic policy for the Forest Service, and somewhat less so for the BLM. In examining community economic stability, the distinction between the business needs of industry and community economic needs is often overlooked (Society of American Foresters Report 1989). While employing local residents, industry interests inevitably differ somewhat from the communities in which they are located. Both communities and industry are substantially affected by forces beyond their control. For communities, the problem is cumulative. The community has little influence on the business decisions made by firms operating in their area, while the firms have little influence on macroeconomic forces that influence their operations. As such, rural communities often find themselves vulnerable to boom/bust cycles, commodity price fluctuations, and national and regional recessions (DeVilbiss 1992).

Berck et al. (1992) sought to examine the influence of timber industry characteristics against that of larger business cycles by separating the effects of being a small, isolated county with an open economy from the effects of being dependent upon timber. Results showed that the timber industry has surprisingly low variation in employment, not much above that of manufacturing as a whole and much lower than agriculture or fisheries. What is different about forestry is the historical extreme reliance of communities on the timber industry alone, and that forestry is usually practiced in isolated areas (Berck 1992).

A study that included several counties in the project area by Ashton and Pickens (1995) found it was not the presence of resource use employment in a county that caused communities to be vulnerable to change, but the absence of other jobs that would contribute to a more diverse economy. Ashton found that areas with proportionately high resource use employment and Forest Service involvement tend to be less diverse. More favorably, Ashton found that these counties tend to be diversifying more rapidly than others.

Some important economic factors that affect the relationship between a community and local wood products firms includes alternative sources of supply, geographic isolation (proximity to larger labor markets), inter-mill competition for timber supply, inter-community competition for jobs, and changing technology.

Timber Dependency

An issue closely tied to community stability is timber dependency, commonly put in the context of "timber-dependent communities." Timber dependency is a broadly recognized and studied economic relationship between Federal lands (most notably National Forest System lands), rural communities, and regional economies. It is an issue deeply entrenched in the conventional wisdom of Federal land use in the West and frequently mentioned by the public in the project area. The issue of community dependency on the livestock grazing industry has not received the same attention as timber dependency, and is not specifically dealt with here.

Defining the resource dependency of communities generally stems from two factors. First is the size of the community ~ a variable usually representing rural, geographically isolated communities highly influenced by outside economic forces and typically tied to one or few resource-based industries. Second is the percent of employment associated with timber harvest and processing. Dependency of wood processing mills on Forest Service timber became important after World War II when National Forests increased the volume of timber available for sale. This made it possible for an increasing number of facilities to get established without any timber land of their own, relying only on Forest Service timber (Dana and Fairfax 1980).

In 1987, the Forest Service identified communities thought to be dependent on National Forest timber, as required by the National Forest Management Act of 1976, including communities in the UCRB. This list was re-examined in the context of new information to see if the listing appeared valid today. The original criteria for listing communities was that forest products employment was at least 10 percent and that local wood processing firms used at least 50 percent National Forest timber. Harris (1995) concluded that 41 communities in the UCRB planning area (32 in Idaho and 9 in Montana) have greater than 10 percent employment in timber processing. The percentage of National Forest timber used could not be determined. Mill surveys for Oregon and Washington showed that the number of mills relying heavily on National Forest timber has generally decreased in the last decade.

Isolated Timber Dependent Communities

Recognizing that the 1987 list of 66 timber-dependent communities (17 of which were in Idaho, 13 in Montana) developed by the Forest Service did not account for population growth and geographic isolation, project economists reassessed the list using these criteria. The rationale was that communities judged to be most at risk to changes in Federal forest policy were those with small populations, located in counties with low population densities, and judged to be relatively isolated (Rheiner 1996). The result was the identification of 29 "isolated timber-dependent communities" thought most dependent on Forest Service timber sales (Economic STAR 1996). This revised list, together with the additional community assessments provided in the Social STAR (1996) provides information useful for identifying "priority areas" where the Forest Service might emphasize land uses that serve economic and social needs of these communities.

Predictability of Supply and Processing of National Forest Timber

Public scoping has shown that predictability in the volume of timber offered for sale from agency lands is an important public issue. Predictability is important to industries that harvest and process timber and to communities with substantial employment in these industries. An explanation of this issue is important to understanding the economic and social conditions relevant to agency decisions.

Predictability in timber sale volume offered from lands administered by the Forest Service and BLM is difficult to achieve. Declining and less predictable Federal timber availability has resulted from: (a) actual reductions of timber caused by declining forest health and (b) the challenges and complexities of meeting current regulations and policies in an ever-changing legal environment, especially in relation to broader issues such as ecosystem health, anadromous fish, and other wide-ranging species of concern. Unpredictable natural disturbances such as wind storms, forest fires, insect and disease epidemics, and even volcanic eruptions can change the amount and rate of timber volume that can be offered for sale. The same holds true for social change from lawsuits, new laws resulting from realignments of political

power, and changing national budget priorities ~ all of which can affect the volume of timber offered for sale.

Expectations of Timber Supply

Historically, the timber industry assumed that national forest allowable sale quantity (ASQ) projections were indicative of future supply. Though ASQ represents a maximum capability rather than planned output, the industry position was reinforced by Forest Service even-flow supply policies; historical agency timber outputs at ASQ level; timber program funding by the Congress; and specific supporting language in NFMA regulations (36 CFR 219.16). Also, ASQ projections were the only numbers offered to represent potential future supply until the Northwest Forest Plan first used the term "probable sale quantity" or PSQ to portray the likely level of sustainable harvest as opposed to a theoretical upper limit (ASQ). Like ASQ determinations, the probable sale quantity was based on regulating the acres available for timber harvest to calculate a "sustainable" supply, but timber volume reductions were factored in to account for new silvicultural practices and operational limitations (Johnson et al. 1994).

Even if the flow of timber sale volume were predictable, it could not be assumed ~ absent agency policies that emphasize local resource use ~ that local mills would be the successful bidder for agency timber sales, nor that local communities would receive logging and processing jobs as a result of those sales. In the mid 1990s, the destination of Forest Service timber was less predictable as processors reached farther than normal for timber to supply their mills. Log sorting yards and high efficiency mills disperse logs differently than was customary, directing logs to their most profitable use. These conditions undermine confidence that Forest Service timber supply policy alone is capable of supporting jobs in specific communities.

Timber Projections for the Upper Columbia Basin Draft EIS

The timber supply estimates developed for the UCRB DEIS are different than the ASQ-type projections found in land management plans and the PSQ-type projection used in the Northwest Forest Plan. UCRB Draft EIS estimates are derived from a vegetation succession model rather than a traditional harvest regulation model as used in land management plans. Using a conventional interpretation of sustained yield, the sustainability of these timber volume estimates cannot be verified at this scale. The timber volume estimates in this plan are not specific to National Forests or BLM Districts, nor do they account for changes in land allocations that may result from upcoming land management planning. NFMA-mandated ASQ determinations, not applicable to this Draft EIS, will be calculated through the land management planning on individual National Forests. Similar determinations will be made on BLM Districts with a commercial timber component. It is expected that probable sale quantities (PSQs) will be determined and displayed in supply schedules separate from land management plans.

Federal Policy and Actions Supporting Community Stability

Supporting rural communities through management of public lands is primarily a social goal, though it is often framed in economic terms such as jobs and income. An examination of past agency policy and efforts supporting this goal helps to establish a basis for future decisions. Key factors include the capability and willingness of the Forest Service and BLM to manage the forests and rangelands under their jurisdiction for the benefit of communities.

Neither the Forest Service nor the BLM has a specific legal mandate to provide economic stability to rural communities. Both agencies have legislative direction that permits and encourages consideration of community economic stability when planning or implementing plans. Contemporary legislation guiding both agencies (NFMA and FLPMA) is oriented toward planning methodology rather than specifying economic or social policy goals (Dana and Fairfax 1980). Thus, the Forest Service and BLM have discretion, absent additional guidance from Congress, to establish economic and social goals appropriate to their agency's missions and available resources.

Rangelands Administered by the BLM

The dominant use on BLM-administered rangelands has been livestock grazing, a use that preceded by 60 years the Taylor Grazing Act of 1934, which is the law that brought regulation to livestock grazing on the public domain lands. The Act gave the BLM a legislative mandate to "stabilize the livestock industry dependent on the public range (Dana and Fairfax 1980)." The strong ownership felt by the livestock operators for the public range did not diminish with regulation. The relatively low productivity of the public domain rangelands under the jurisdiction of the BLM has limited other commodity uses of these lands in addition to livestock grazing. Thus, regulating livestock users has been the primary focus of the BLM on these lands.

In the 1960s the BLM began to expand from regulating grazing to a more comprehensive land management approach. This trend continued with the passage of the Federal Land Policy and Management Act of 1976 (FLPMA), which promoted multiple-use and sustained yield management. This act also sought to promote stability in livestock grazing by authorizing 10-year grazing permits and requiring two-year notices of cancellation. It readjusted the distribution of grazing fee funds, with 50 percent going towards range improvements; at least half had to be spent in the BLM District where it was collected. The act also authorized loans to State and local governments to relieve social and economic impacts of mineral development (Dana and Fairfax 1980).

Forest Service Timber Policy and Communities

Use of the National Forests for national and regional growth and development was the Federal policy when the Organic Act was passed in 1897, and such use has remained important. Early policy represented a belief that resources existed for the benefit of the local residents who needed them. The 1905 Forest Service's Use Book listed "protecting local residents from unfair competition in the use of forest and range" as a principal objective of the Forest Reserves, apparently in response to concern about the influence of big industry.

The Forest Service was an early promoter of using a sustained yield even-flow timber policy to promote the stability of forest communities (USDA 1933). Congress, in the White Pine Blister Rust Protection Act of 1940, mentioned for the first time maintaining community stability as the purpose of an act of the Federal government. The idea of community stability was firmly connected to timber supply in terms of sustained yield, in the Sustained Yield Forest Management Act of 1944. This Act gave authority to establish Cooperative Sustained Yield Units to "promote the stability of forest industries, of employment, of communities, and of taxable forest wealth" intending to support the stability of communities primarily dependent on Federal timber. This act applied equally to forest lands administered by both the Forest Service and BLM.

The Morse Amendment of 1968 prohibited the export of unprocessed logs from National Forests west of the 100th meridian, with the intent to protect domestic wood processing jobs. Beginning in the early 1970s the Forest Service and the U.S. Small Business Administration implemented a Small Business Set-Aside program. This program set aside a certain percentage of Forest Service timber sales for exclusive bidding by small firms (companies with fewer than 500 employees). Observers of the program believe it helped solidify a timber supply for small firms and maintained a segment of the timber industry operated by small businesses.

The National Forest Management Act (NFMA) of 1976 added substantially to Forest Service community stability policy. It solidified a traditional, but contentious even-flow timber supply strategy for National Forests through the sustained yield and nondeclining even-flow (NDEF) provisions in section 11 (36 CFR 219.16) of that law. Both sustained yield and nondeclining even-flow were designed in part to address community stability issues (Dana and Fairfax 1980). Community stability also surfaced in section 14 (e)(1) of NFMA, requiring bidding methods for timber sales to "consider the economic stability of communities whose economies are dependent on such National Forest materials," with regulations requiring "dependent communities" to be one of several factors considered (36 CFR 223.88). From this, in 1977 and 1987 the Forest Service developed lists of communities expected to better retain

wood products employment if nearby National Forests had the option of using either oral or sealed bidding to sell timber (from Forest Service correspondence 1977 and 1987).

The National Forest-Dependent Rural Communities Economic Diversification Act in the 1990 Farm Bill sought to provide assistance to rural communities located near National Forests that fit a specified definition of "economically disadvantaged" due to the loss of jobs or income derived from forestry, the wood products industry, or related commercial enterprises such as recreation and tourism in the National Forest (Ashton 1995).

Even Flow and Timber Supply

The remedy for the "boom and bust" cycles favored by the Forest Service has been to maintain an even flow of timber sales, transferring a large share of cyclic economic adjustment costs from the community to the Federal Treasury (Boyd 1989). As applied to the community stability problem, this meant maintaining a constant supply of timber so that macroeconomic-induced changes in timber demand did not shut down the mills (and jobs) in rural western communities.

The even-flow approach was also used to support existing processing capacity (and jobs) in rural areas aside from dampening the effects of business cycles. In one case, this was formally pursued by authorization of sustained yield units under the 1944 law. In other cases, it became a consideration in agency decisions. A proposed 1991 Forest Service policy on below-cost timber programs (timber that the Forest Service sold at a financial loss) specifically allowed extending below-cost programs to lessen effects on dependent mills. The 1977 and 1987 NFMA lists of timber-dependent communities were based more on sustaining customary use than the notion of dampening cyclical effects.

Literature is ambiguous regarding the relationship of sustained timber yields and community stability, as measured by employment in the timber industry (Force 1993). Many factors undermine the potential use of even-flow supply of timber to stabilize rural communities regarded as timber-dependent. Important macroeconomic forces are at work that are beyond local control. Federal managers are unable to deliver an even-flow of timber according to projections because of the need to manage for other uses and meet changing public desires. Stabilizing an industry is not the same as stabilizing a community. Lastly, Federal timber can be purchased and transported long distances rather than purchased locally and used to provide jobs in the community.

Community Resiliency

Recently, many social scientists documenting challenges facing rural communities throughout the country have concluded that stability is just one way to achieve the broader goal of prosperous, vital communities:

> *"Community adaptability may be a more useful concept than community stability in assessing which communities will thrive in our rapidly changing world. Levels of human capital, the imagination of community leaders, the ability to access information, and the availability of a flexible, diverse resource base are variables that will likely affect community adaptability" (Beckley 1994).*

Community resiliency ~ the ability to successfully deal with the inevitable multiple social and economic changes that are evident in our society ~ is one of the most important indicators of a community's health and vitality. Harris and others (1995) described resiliency as consisting of population size, economic strength and diversity, attractiveness and surrounding amenities, strong leadership, and other factors such as a community residents' ability to work together and be proactive toward change. This definition of resiliency is similar to the concept of community capacity (FEMAT 1993).

Harris and others (1995) used the Community Self-Assessment information to develop a relative scale of community resiliency for rural communities of less than 10,000 people in the project area, to measure how well-equipped communities are to deal with change. The most resilient communities tended to be larger in population, have an economy based on a mix of industries, view themselves as autonomous, and have worked as a community to develop strategies for the future. Many communities are beginning to work together to identify ways of capitalizing on their location and other characteristics to cope with the many changes affecting their

health and vitality. The data showed that there are many paths to achieving resiliency.

Population Size and Growth

The population of a community and rate of change of that population are often used as indicators of economic diversity, economic resiliency, community vitality, and whether the community is prospering or in decline. Haynes used population growth as a proxy for economic growth (Economics STAR 1996). The "Forest Service/BLM timber and forage importance index" introduced earlier in this section does the same. Generally, this assumption is reasonable.

Communities with larger populations lead to more businesses such that many industries are represented with many firms in each industry. Employment opportunities follow. This economic diversity provides a cushion to job losses in declining industries because the economy does not depend heavily on any single industry or firm. A larger economy also means that less money leaks from the local economy to pay for goods purchased from outside. The result is a more economically resilient community. It is unlikely that land-use decisions of the Forest Service or BLM will substantially affect communities with larger populations and diverse economies.

The converse of the above is generally true for communities with small populations, having fewer industries and fewer firms per industry. Even where many industries are represented, each may include only a few firms. A decline in one industry or loss of a firm, especially if a major employer, can mean high job loss in the community until adjustments are made. This can be especially disruptive if the community is geographically isolated with few alternative employment opportunities. This situation describes many rural communities with a high proportion of employment in agriculture and natural resource commodity industries. It is reasonable to expect that the Forest Servic's and BLM's land-use decisions can affect industries that are important to smaller communities near lands administered by these agencies, especially where the communities are geographically isolated.

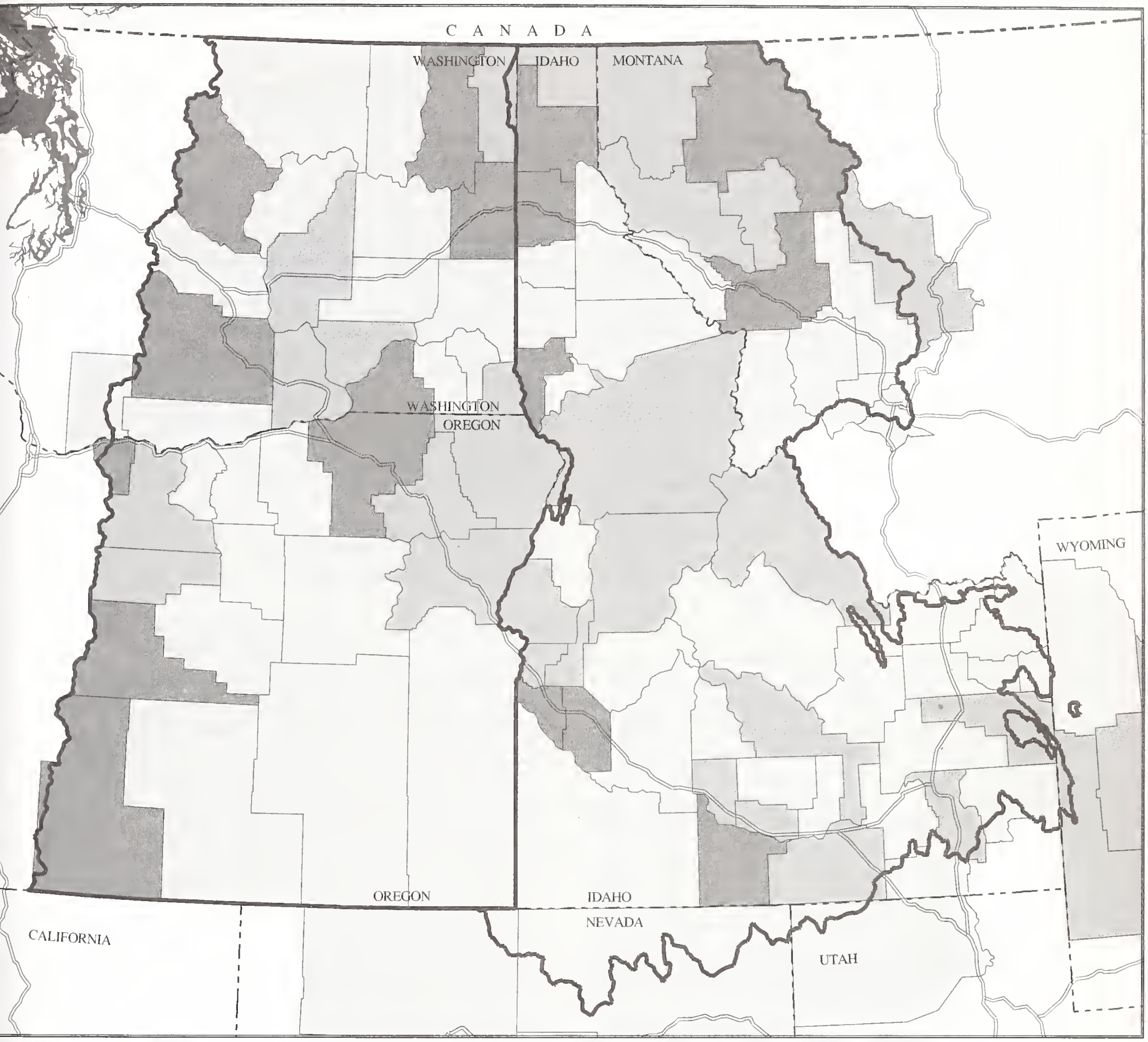
Population growth is usually associated with economic growth and vice versa. However, this is an incomplete explanation. Some agricultural communities are losing population as greater efficiencies in farming decrease labor demands without decreasing economic output. Gilliam County in Oregon is thought to be an example of this condition. Additionally, a community can experience rapid growth followed by rapid decline ("boom and bust"), a situation well known in the West. Finally, it must be determined whether economic growth is driving population growth or the other way around. The Economic STAR (1996) assumed the latter. The premise was that high levels of environmental amenities, such as clean water and scenic views (mostly attributed to Federal lands), rather than high levels of resource commodity use, provides a quality of life that invites in-migration. Economic growth is thought to follow this amenity-driven in-migration, with substantial credit given to empowering computer and communication technologies.

Analysis of population change by Haynes and McCool (unpublished) could not determine that expected high population growth in the project area would be affected by land-use decisions of the Forest Service or BLM (Economic STAR 1996). Projections of population growth were not done for areas smaller than BEA multi-county regions.

Economic Diversity

Economic diversity is considered an important component of economic resiliency, whether measured at community, county, or regional levels. Economic diversity is considered important to quality of life attributes provided by economic opportunity and services, including infrastructure, medical care, education, commercial services, and the critical presence of job opportunities (Rojek et al. 1975). The following discusses economic diversity at different geographic scales.

A measure of economic diversity using the Shannon-Weaver Diversity Index (Alward 1995) is available for each county in the planning area and for BEA trade regions (map 2-30). Using IMPLAN data, this index is derived from the number and variety of industry sectors and associated employment. Given that economically diverse systems are thought to be more resilient, the index is used here to characterize the ability to absorb and rebound within the planning area.



50 0 50 100 150 miles

50 0 50 100 150 km

N

Map 2-30.
Economic Resiliency Ratings

High
Moderate
Low

County Boundaries
Major Roads
EIS Area Border

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996

The size of area over which economic diversity is measured is important. The larger the area considered, the greater the economic diversity and expected economic resiliency, especially if it means including a large metropolitan area (trade center). Neither counties nor communities are considered "functional" economies because they do not include enough parts of the economy to be even a moderately complete system. This is why trade regions like those developed by the Bureau of Economic Analysis consist of large multi-county areas. This is illustrated by the fact that the Shannon-Weaver diversity index for every individual county in a BEA region is considerably less than the diversity index for the region as a whole. This also shows why a multi-county region can be highly resilient while many individual counties within that region have low resilience. This is a condition found in the project area.

Community Economic Diversity

The employment profiles of nearly 400 communities with less than 10,000 people in the project area were measured to develop local indices of economic diversity. The methodology followed that developed by Robison in his work on community economic impact analysis (Robison 1995). The resulting economic diversity values represent a relative index of the employment structure of the measured communities. It is a construction based on the number of industries reported in a town and the proportion of the workforce in any single industry. The greater the number of industries and the higher the distribution of the workforce across industries, the higher the index value. This index is a useful characterization of the current employment structure. It is less useful for predicting future change.

Perceptions of Economic Diversity

As part of the Community Self-Assessment (Harris et al. 1995), participants were asked about their perceptions of the economics of their community. People perceived farming and agriculture as most important in terms of dependence of communities on natural resources, followed by grazing and ranching, outdoor recreation and tourism, forest products, and mining and mineral resources. People perceived that most towns' economies were linked to a mix of natural resources; only nine percent of the communities were perceived as highly independent of farming and ranching, 13 percent independent of tourism and recreation, and 37 percent independent of timber. About 25 percent of all communities were viewed as having a mixed economy, with no dominant industry.

Perceptions were compared with the actual economic profiles of each community. Overall, people were fairly accurate in their perceptions, but they tended to underestimate the diversity of their economy and overestimate the importance of traditional industries. There could be several explanations: people could simply be overestimating dependence on timber; people could be basing their perceptions on income effects or social influence instead of percent of employment; or job growth in non-traditional industries has not been fully recognized.

Community Social and Cultural Attributes

Population size and growth, employment and wages, and economic diversity have been identified as important to resiliency. Based on the responses of participants in the Community Self-Assessment Workshops, community social and cultural attributes are important. These include:

Strong civic leadership ~ A high commitment of individual leaders and groups to community and active involvement in creating and/or responding to change; a strong sense of local control regardless of external events or influences.

Positive, proactive attitude toward change ~ Residents either promote change and thus vitality in community development or, if change is occurring on its own, residents respond positively and create a desirable future.

Strong social cohesion ~ A high degree of consensus in values and goals for a desired future; working together to achieve goals.

Based on these data, together with economic profiles (measuring diversity) of each community, Harris developed a relative scale of community resiliency for rural communities of fewer than 10,000 people in the project area. His intent was to use the resiliency index to measure how well-equipped the community is to deal with change. The communities were divided into four classes, with 25 percent of the communities in each class: low, moderately

low, moderately high, and high resiliency. This methodology is new and as yet unreviewed, but is felt to be a useful in that some common characteristics emerged: more resilient communities tended to be larger, have an economy based on a mix of industries, be more autonomous, be rated by residents as having a local government responsive the public, and have plans for dealing with change (Harris 1995).

Some of the things people typically base their evaluations on include feeling a part of the community, having a sense of control over decisions that affect their future and the future of their community, knowing that local government is acting in ways that benefit people equitably rather than acting for a privileged few, living without fear of crime or environmental hazards, and feeling confident that one's children have a fair start in life (Branch et al. 1982). Forest Service and BLM land uses have little direct effect on these conditions.

Amenity Setting

A high degree of physical amenities ~ the historical character and attractiveness of a community's downtown, the attractiveness of the community's setting regarding scenic and recreational opportunities, and the lack of negative elements such as air or water pollution ~ is another important component of resiliency (Harris et al. 1995).

The presence of desirable environmental amenities, and especially the types supplied by public lands, can contribute to an area's population and economic growth. Scientists differ in their interpretation of the importance of this benefit, which can differ depending on the scale at which it is measured. Because tourism and recreation, retirement settlement, and other uses of Forest Service- or BLM-administered lands can provide significant sources of jobs, income, and personal enjoyment, communities value these agency and other public lands for these uses (Society of American Foresters Report 1989). Some evidence to support this relationship is the high population growth occurring in areas with high recreation use (Johnson and Beales 1994). Ashton found that recreation counties tend to be diversifying more rapidly than others, attributing this to Forest Service and BLM multiple-use policies which provide an environment that attracts both tourists and permanent residents to the area (Ashton 1995).

Rasker (1994), Power (1994), and others have emphasized the role of a high quality natural environment, scenic beauty, and recreation opportunities in influencing population growth and shaping the emerging economy of the project area. For example, Rasker (1995), writing about the project area, stated that,

> *"As we approach the twenty-first century, there is a striking change in how the region's forests, mountains, streams, rivers, and grasslands contribute to the economic life of its residents. Once, settlers were attracted to the region by the promise of logging, ranching, mining, and farming. Now, the magnet that draws new residents and holds the region's existing inhabitants is environmental quality: clean air and water, handsome scenery, and native wildlife...the region's economy is growing less dependent on resource extraction and more dependent on less tangible qualities: environmental quality, education, entrepreneurship, and capital."*

There is evidence for a positive relationship between environmental quality, amenities, and economic advancement. This relationship focuses in part on the free services the environment provides to the economy (Templet 1995). A study of all 50 States demonstrated that poorer economic conditions exist where environmentally risky activities are more intense (Templet 1995). Other studies (Meyer 1992, Cannon 1993, Hall 1994) similarly found positive relationships between environmental preservation and economic well-being. For example, people migrate to areas based on a variety of factors including environmental quality. McBeth (1995) found that a vast majority of rural citizens chose to remain in or move to their communities because of the environment. Harris (1995) found that 40 percent of new arrivals in Idaho cited the environment as a reason; 63 percent cited "quality of life," and 22 percent stated they moved to Idaho because of a job. Power (1991) concluded that individuals choose where to live based on attractive natural and (rural) social environments and then economic activity follows. The Rudzitis (1995) survey, however, found that 36 percent of residents in the project area cited job opportunity for living in the region, while 28 pereent were in the region because they wanted to live there and then looked for or created a job.

It should also be noted that if environmental quality of the region as a factor attracting new arrivals is occuring after more than a century of land use, then it may be useful to establish whether the region is now attractive in spite of land uses, or whether historical land uses have occurred in a manner and to the degree that there is compatibility with amenity values. Ideally, land-use practices should be designed, and in many cases have been designed, to achieve both maintaining use of natural resources while not contributing to a deterioration of the amenity values of the region.

Quality of Life

Machlis and Force (1994) identified a number of indicators of social conditions regularly monitored by various agencies that provide indirect measures of quality of life. Usually collected at the county level, these indicators include conditions such as crime rates, income and employment levels, pollution, and voting rates. Only employment and income have been closely linked to uses of Forest Service- and BLM-administered lands.

Quality-of-life assessments take into account people's perceptions. Considerations include perceptions about the attractiveness and aesthetics of the local environment (Pulver 1989) and the quality of services such as infrastructure, medical care, education, and commercial services (Rojek et al. 1975). Many of these characteristics could be summed up in the project area as "small town values." However, many local residents who participated in the Interior Columbia Basin Ecosystem Management Project suggested that many other factors were meaningless if they did not have a job.

One measure of baseline conditions regarding quality of life in rural communities was provided by participants in the Community Self-Assessment workshops (Harris et al. 1995; the Community Resiliency section describes these data). These community leaders and residents generally rated quality of life in the project area as high; 80 percent believed that their community was "safe, friendly, and a good place to live; few rural communities can match its quality of life."

A Harris and Associates (1995) public opinion poll covering Oregon, Washington, and Idaho asked people if a major reason thcy moved to the region was because of a job, because of the environment, or because of family and quality of life. The responses, for the three States as a whole and for people in Idaho, indicate a clear difference in that the environment and family/ quality of life received a higher response than job-related reasons (note that respondents could choose more than one reason). In fact, only in the State of Washington did respondents cite a job as a major reason more than the environment. Idaho led the three States citing the environment and family/ quality of life as major reasons for moving. Finally, it should be noted that the difference between citing the environment versus citing family/quality of life as a major reason indicates that people's perceptions of quality of life include more than environmental considerations, but also take into account family, crime, schools, and other things.

One major reason moved to the Pacific Northwest:

	Northwest (3 States)	Idaho Only
A Job	31%	22%
The Environment	32	40
Family/Quality of Life	50	63

Attitudes, Beliefs, and Values

Most people in the United States today (more than 75 percent of respondents in a recent survey) express attitudes supporting conservation and a high priority for environmental protection in general. Over time, the political and social environment of the United States has become increasingly concerned about preservation and restoration of the environment (McBeth 1995). A 1995 survey of Idaho, Oregon, and Washington residents (Harris and Associates, 1995) found that 57 percent considered themselves "an environmentalist" while 41 percent did not.

Survey research typically finds differences in opinions between residents of small, rural towns in the interior basin and residents of larger urban areas. National samples tend to be stronger on environmental protection, be less sympathetic to local economic impacts, and have greater trust in the Forest Service and environmental organizations than do local residents. For example, residents of small towns in the Pacific Northwest were less likely than city

residents to favor strengthening the Federal role in resource protection (Harris and Associates 1995). The same survey also showed a larger percentage of respondents from small towns and rural areas in Idaho, Oregon, and Washington believe current Government policies tend to favor the environment too much over jobs, relative to their urban and suburban counterparts. When rural community leaders were asked, "what is the biggest problem facing rural communities," the most frequent response focused on the need for balancing the environment and the economy (McBeth 1995).

The fact that support for environmental protection is somewhat less in small communities and rural areas does not mean, as some may have concluded, that residents of the countryside do not favor protection of the environment. Recent researchers have found, in fact, that rural residents do favor clean and healthy environments (McBeth and Foster 1994; Alm and Witt 1995; Fortmann and Kusel 1990; Rudzitis and Johansen 1991), but the differences between rural and urban/environmental attitudes are real.

Citizens in rural communities are aware that environmental and economic concerns must be balanced. For instance, in studies of over 20 communities of southern and southeastern Idaho, respondents selected "air quality," "water quality," and "open spaces" as the three most satisfying aspects of their community life (Idaho State University Surveys 1990–1995). Conversely, respondents chose a "lack of employment opportunities" and a "lack of retail shopping" as the most dissatisfying features of rural life (Idaho State University Surveys 1990–1995). The respondent's emphasis on the environment shows that the traditional sense of place and attachment to the land still plays the most significant role in rural life. Furthermore, the emphasis on employment opportunities is also rooted in the desire to preserve the community. Specifically, rural citizens largely desire increased employment opportunities so their children will be able to remain in the community.

Both locally and nationally, people believe that local residents and others most affected by public land management should participate and have a strong say in the outcome. The 1995 Harris poll, for example, found that support for increased environmental protection is significantly greater when State or local governments take the initiative than when the Federal government does.

When polled about the lands managed by the Forest Service and BLM, residents in the interior Columbia River Basin (Rudzitis et.al. 1995) or Idaho (IFPC 1992) indicate strong support for a variety of land-use activities, notwithstanding perceived or real conflicts between these uses. IFPC (1992) found that Idahoans strongly or somewhat approve of ranching (78 percent), mining (60 percent), timber harvest (75 percent), recreation (92 percent), and wilderness protection (86 percent) on the Federal lands in Idaho. Rudzitis et al. (1995) asked interior Columbia River Basin residents how important various uses and management strategies were on Federal lands. Respondents who felt that specific land uses were important (as opposed to an opinion of neutral or unimportant) for the following uses were as follows: protect water/watersheds (82.1 percent), protect fish and wildlife habitat (78.6 percent), recreation (77.3 percent), preserve wilderness values (72.6 percent), protect ecosystems (71.6 percent), timber harvest (65.4 percent), ranching (56.2 percent), protect endangered species (48.1 percent), and mining (31.4 percent).

Public opinion is divided, however, over specific issues or over questions where choices or trade-offs are required, including but not limited to issues such as additional Wilderness designation, trade-offs between jobs and Wilderness designation, construction on new roads in roadless areas, and clearcutting practices.

Attitudes, beliefs and values can also be expressed by how people and groups define ecosystems and specific locations in the landscape based on the meanings and images of those places. This information is referred to as "sense of place," based on Galliano and Loeffler (1995b), who concluded that ecosystem management should incorporate the many meanings people have assigned to various geographic locations on public lands in the project area into land management planning, implementation, and monitoring. This is one way of translating ecosystem management into terms that have meaning for people.

Role of the Public in Public Land Management

Public participation is guided by the National Environmental Policy Act (NEPA), National Forest Management Act (NFMA), Federal Land Policy and Management Act (FLPMA), their guidelines, and other laws that contain legal requirements for incorporating public input into natural resource decision-making.

Despite legislative mandates for public involvement and agency efforts to meet these requirements, the underlying goals of public involvement are not being met (FEMAT 1993). These goals include not just informing people and soliciting their opinions on proposed actions, but integrating peoples' concerns into decisions to be responsive to the public for whom the Forest Service and BLM are administering public lands under their jurisdiction. It has proven difficult for Federal agencies to demonstrate how public concerns were incorporated into decisions (FEMAT 1993). There is evidence that fuller participation is being demanded by the public and that it is often successful where implemented.

A survey conducted for the Social Assessment (Social STAR 1996) found public preference was greatest for the opportunity to act as a full and equal partner (chosen by 32–39 percent) and serving on advisory boards (chosen by 30-32 percent). Providing suggestions and having the public make the decisions were chosen by roughly equal numbers (about 1–18 percent), with "none" (letting resource professional decide) chosen by just 1–3 percent). This widespread public interest in having a greater role in natural resource decision-making is consistent with the public participation philosophy of ecosystem management, which requires close and frequent collaboration with the public and stakeholders in public land management (Krannich et al. 1994).

Many collaborative groups have formed in the past few years to jointly address natural resource issues. Wondolleck and Yaffee (1994) studied what they called building bridges—public participation activities designed to increase collaboration among Forest Service and non-Forest Service boundaries. Examples of such groups in the UCRB include the Henry's Fork Watershed Council and the local groups formed under Gov. Marc Racicot to address protection of bull trout in Montana. The authors stated that bridges were necessary for a variety of reasons: they allow agencies to acquire needed information from the public; they generate good resource decisions that will endure; they build support for forest management decisions; they influence public knowledge and values; they broaden the workforce available to get things done on the ground; and they make the agency a better neighbor.

The Federal Advisory Committee Act (FACA) has posed a barrier to effective public/private efforts to assist with public land management planning, implementation, and monitoring. Congress recently enacted an exemption to FACA for State, local and tribal elected officials in Section 204 of the Unfunded Federal Mandates legislation, allowing Federal agencies to receive advice and recommendations from elected officials and not violate FACA. The ICBEMP subsequently signed an MOU with the associations of counties in Idaho, Montana, Oregon and Washington, which details how county commissioners will provide advice and recommendations to the project. County interest in Federal land management stems from a local area having an economic and cultural reliance on the Federal lands and the variety of goods and services produced.

The Northwest Forest Plan created Province Advisory Committees to improve public participation. The BLM, as part of new regulations on livestock grazing, are developing Resource Advisory Councils (RAC), each one covering a distinct geographic area. Formed under the Federal Advisory Committee Act, the RACs are designed to make recommendations to the Forest Service and BLM on ecosystem management, watershed planning, and other local or regional natural resource issues.

Photo 26: Public participation in natural resource decision-making is a key feature of ecosystem management. Photo by USFS/Boise NF

American Indians

Key Terms Used in This Section

Band ~ A band is a group of people who share a culture, territory, and sense of mutual recognition. Bands are primarily those pre-treaty-making-period American Indian groups.

Beneficiary ~ The recipient of payment or entitlement based upon an agreement, contract, or treaty. Indian tribes in the project area signed treaties and agreements with the United States in exchange for promises by the United States to "secure" or guarantee rights the Indians reserved in these treaties and agreements.

Ceded lands ~ Lands that tribes ceded to the United States by treaty in exchange for reservation of specific land and resource rights, annuities, and other promises in the treaties.

Consultation ~ (1) An active, affirmative process which (a) identifies issues and seeks input from appropriate American Indian governments, community groups, and individuals; and (b) considers their interests as a necessary and integral part of the BLM and Forest Service decision-making process. (2) The federal government has a legal obligation to consult with American Indian Tribes. This legal obligation is based in such laws as NAGPRA, AIRFA, and numerous other Executive Orders and Statutes. This legal responsibility is, through consultation, to consider Indian interests and account for those interests in the decision.
(3) Consultation also refers to a requirement under Section 7 of the Endangered Species Act for federal agencies to consult with the U.S. Fish and Wildlife Service and/or National Marine Fisheries Service with regard to federal actions that may affect listed threatened or endangered species or critical habitat.

Lifeways ~ The manner and means by which a group of people lives: their way of life. Components include language(s), subsistence strategies, religion, economic structure, physical mannerisms, and shared attitudes.

Tribe ~ Term used to designate a federally recognized group of American Indians and their governing body. Tribes may comprise more than one band.

Trustee ~ One that holds legal title to property to administer it for the benefit of another. The Federal Government's trust responsibility arises from promises made in treaties, executive orders, and agreements. Certain lands and resources of Indians are entrusted to the United States Government through those treaties and agreements.

Summary of Conditons and Trends

- ◆There is low confidence and trust that American Indian rights and interests are considered when decisions are proposed and made for actions to be taken on BLM- or Forest Service-administered lands.

- ◆American Indian values on Federal lands may be affected by proposed actions on forestlands and rangelands because of changes in vegetation structure, composition, and density; existing roads; and watershed conditions.

- ◆Indian tribes do not feel that they are involved in the decision-making process commensurate with their legal status. They do not feel that government-to-government consultation is taking place.

- ◆Culturally significant species such as anadromous fish and the habitat necessary to support healthy, sustainable, and harvestable populations constitute a major, but not the only, concern. American Indian people have concern for all factors that keep the ecosystem healthy.

Introduction to American Indians

This section describes the cultural history, legal context, and existing Federal agency relations with the project area's affected American Indian tribes. The ways American Indians use Forest Service- or BLM-administered lands are discussed in the context of their cultural, social, economic, religious, and governmental interests. The United States Government has a unique responsibility to Indian tribes. Implications from this responsibility for Forest Service or BLM decision-makers are described as they relate to ecosystem-based management in the project area.

Cultures

People rely on their culture in order to live, relate to others as collective groups, and know how to both understand and function in their world. A culture includes religious, economic, political, communication, and kinship systems. Together these guide group behaviors and instruct members of the group. Culture is the whole set of learned behavior patterns common to a group of people, their interactive behavior systems, and their material goods. A Culture Area is an area where groups of people and their cultures, in this case American Indian tribes or bands, share similar cultural traits and networks.

Most of the prehistoric cultures of the project area belonged to either the Plateau or Northern Great Basin Culture Areas. The Pit River and Shasta tribes, who are associated with the Klamath Tribe, are grouped within the Californian Culture Area. Thirty-two Plateau bands historically occupied the northern portion of the interior Columbia Basin and part of the Klamath Basin. The three Northern Great Basin bands—the Bannock, Northern Paiute, and Shoshoni—occupied most of the project area's southern half. Differences existed among cultures, especially between tribal culture areas. An example of how diverse these cultures were can be seen in the area's 13 distinct native languages, which were associated with 8 separate language families. (In comparison, Europe has only 3 native language families.) Jargon and sign languages helped people communicate across language and cultural barriers, especially for trade purposes. Table 2-18 shows the project area's federally recognized tribes in each Culture Area and the bands within each tribe.

The economic, political, religious, and social systems of First Nations were interdependent and integrated. Native peoples traditionally organized by families, autonomous villages, and to a lesser degree, bands. Their associations and alliances were greatest with neighboring villages. Political, economic, and subsistence strategies were focused on local environments. However, trade networks, trade centers, and task groupings, which interacted with surrounding Culture Areas, extended the focus of bands and villages.

Access to and availability of natural resources was crucial to native people. Many places were visited during a yearly cycle of seasonal migrations (seasonal rounds, see figure 2-24) to collect food, medicines, and other materials, as well as for religious practices and social gatherings. Plants, usually gathered from scablands, meadows, canyons, aquatic environments, and forests, are thought to have provided over half of native people's diets. The

Native Americans, First Nations, and American Indians

Native Americans, First Nations, and American Indians are all terms used to describe Indian people in the project area. Native Americans are people who were the first inhabitants of the western hemisphere. American Indian is a legal term in Federal law and regulation referring, for the most part, to members of federally recognized tribes. First Nations refers to pre-European Native Americans who were self-governing, independent (sovereign), and organized, with social and/or political structure. A "band" is a group of people who share a culture, territory, and sense of mutual recognition. Bands are primarily those pre-treaty-making period American Indian groups. A "tribe" is used to designate a federally recognized group of American Indians and their governing body. Tribes may comprise more than one band.

Table 2-18. Affected Tribes and Bands in the Project Area.

Name of Federally Recognized Tribe[1]	Culture Area	Names of Bands Within Tribe
Blackfeet Tribe	Plains	Southern Piegean, Bloods, Siksika, Northern Piegean
Burns Paiute Tribe	Great Basin	Wada Tika, Hunipui, Walpapi, Koa'agai, Kidu
Coeur d'Alene Tribe	Plateau	Coeur d'Alene, Spokane, San Joe (St Joseph) River
Confederated Salish & Kootenai Tribes	Plateau	Salish (Flathead), Kootenai, Upper Pend d'Oreilles
Confederated Tribes of the Colville Reservation	Plateau	Methow, Sanpoil, Lakes (Senijextee), Colville (Sweelpoo), Kalispel, Spokane, Entiat (Pisquouse), Nespelem, Chelan (Kow-was-say-ee), Columbia (Senkaiuse), Chief Joseph band of Nez Perce, Wenatchee (Wenatshapam/Pisquouse), Southern Okanogan (Sinkaietk), Palus (Palouse)
Confederated Tribes of the Umatilla Indian Reservation	Plateau	Umatilla, Cayuse, Walla Walla
Confederated Tribes of the Warm Springs Reservation	Plateau	Wasco, Dalles (Kigal-twal-la), Dog River, Warm Springs (Taih) or Upper Deschutes, Lower Deschutes Wyam, Tenino, John Day River (Dock-Spus)
	Great Basin	Northern Paiutes
Confederated Tribes of the Bands of the Yakama Indian Nation	Plateau	Klickitat, Klinquit, Liay-was, Kow-was-say-ee, Oche-chotes, Palouse, Shyiks, Pisqouse, Se-ap-cat, Skinpah, Wishram, Wenatshpam, Yakama, Kahmilt-pah
Fort Bidwell Indian Community of Paiute Indians	Great Basin	Gidutikad
Fort McDermitt Paiute and Shoshone Tribes	Great Basin	Northern Paiute, Shoshone
Kalispel Tribe of Indians	Plateau	Aqulispi'lem, Slate'ise
Klamath Tribe of Oregon	Plateau Great Basin	Klamath, (Ma'klaks), Modocs, Yahooskin, Wal-pah-pai
Kootenai Tribe of Idaho	Plateau	Upper and Lower Kootenai
Nez Perce Tribe	Plateau	Nez Perce (Ni mi pu), Upper and Lower Wallowa (Pikunema, Lamata)
NW Band of Shoshoni Nation	Great Basin	Eastern Shoshone (Washakie)

Pit River Tribe of California	California	Ajumawi, Aporige, Astariwawi, Atsuge, Atwamsini, Hammawi, Hewisedawi, Illmawi, Itsatawi, Kosalektawi, Madesi
Quartz Valley Indian Community	California	Shasta, Karok
Shoshone Tribe of the Wind River Reservation	Great Basin	Eastern Shoshone, Arapahoe (not affected)
Shoshone-Bannock Tribes (Fort Hall Reservation)	Great Basin	Eastern Shoshone (including Lemhi), Bannock
Shoshone-Paiute Tribes (Duck Valley Reservation)	Great Basin	Western Shoshone, Northern Paiute
Spokane Tribe	Plateau	Upper Spokane (Snxwemi'ne), Middle Spokane (Sqasi'lni), Lower Spokane (Sineka'lt), Chewelah
Summit Lake Paiute	Great Basin	Paiute

Band names in parentheses are either used in treaty or executive order documents, or are names recognized by tribes. Legally recognized or the most common spellings were used for most tribe and band names.

[1] A tribe is a federally recognized distinct grouping of American Indian people, with a continuous political organization. Federal recognition has implications for trust obligations and entitlement to many federal Indian services. Federal recognition may arise from treaty, statute, executive order, administrative order, or from the course of the federal governments dealing with a group as a political entity.

Source: Keith and Perkins (1996).

Cultural Significance

Cultural significance refers to a whole set of relationships between a group of people, their culture, and their world (landscapes, places, and living and inanimate things). These relationships define and are defined by the values, uses, meanings, and relevance people hold for their world, behaviors, activities, or events. Culturally significant things should be understood and treated within the context of the culture that identifies, manages, and values them.

The cultural significance of salmon in American culture is multi-dimensional. It is a food source, a symbol of persistence and fortitude in a life cycle struggle, an economic industry, a prized game fish, a regional political and environmental issues, and a symbol of the Pacific Northwest region. Additional significance of salmon for many American Indians is founded in their religions, socio-cultural values, and identity as a community or a people.

A better understanding of significance is found in how people relate to salmon through any of the above ways. For sports fishermen, salmon is revered for its size and fight; a single large catch brings individual esteem. Fishing stories provide social bonding and bravado. Indian fishermen revere salmon (steelhead included) as a divinely provided food; it is a "lead-fish" essential on the tables at community dinners. A large catch of fish (enough to both sell and give away) brings social esteem to both the fisherman and the skilled salmon handlers who prepare and serve the catch. Stories about salmon bond individuals, family, society, places, and land together.

rest of their diet came from fish, mammals, and birds, which were available in varying amounts. These and other natural resources were an integral part of tribal culture, and are still culturally significant to American Indians.

Well-traveled routes between villages, temporary camps, resources, and gathering places were used for seasonal migrations. Winter and summer villages, which served as residential bases, were established based on the availability of water, shelter, food, and other resource needs. Resources were not found in the same abundance in each band's subsistence area. The annually varying abundance of anadromous fish, subsistence animals, and food plants in known gathering areas was balanced by trade with other bands. The geography and distribution of resources in each band's subsistence areas along with differing family strategies created unique seasonal migration patterns.

Both Plateau and Great Basin groups had resource areas that drew bands together to share resources in particularly rich places. The Columbia, Snake, and Klamath Rivers; and The Dalles/Celilo Falls, Kettle Falls, Upper Klamath Lake, and Boise Falls had premier fisheries. Well-known plant gathering places in the project area included the Grande Ronde Valley in Oregon, Idaho's Camas Prairie, and meadows and prairies south of the Spokane River in Washington. These places were also significant meeting areas, trade centers, or habitation sites.

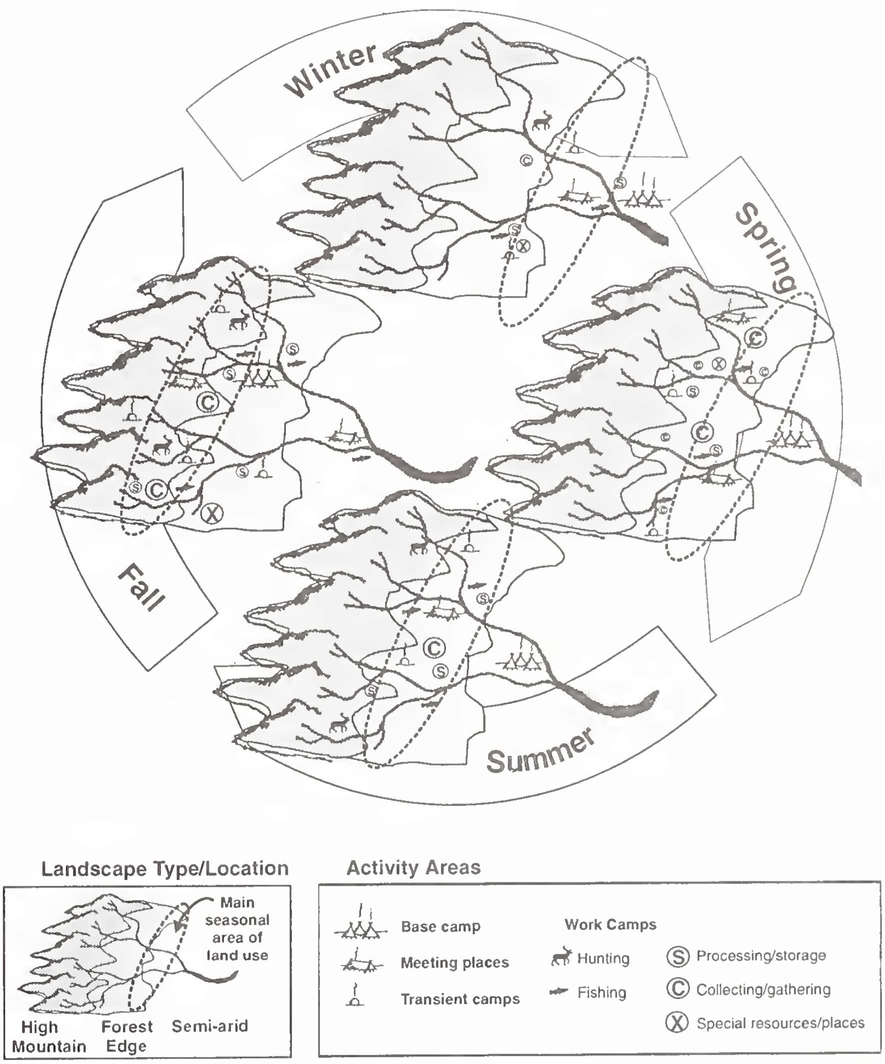


Figure 2-24. Seasonal Rounds - An example of how a Native American band might have travelled across the land within and beyond their homeland. As each season progressed, family units left their lowland winter residence and followed the seasonal cycle of plant, animal, and aquatic life forms as they became available for harvest.

Changes in Uses of and Relationships with the Land

Although early populations are difficult to estimate, the project area's tribal population was likely highest in the mid- 1700s. American Indian populations have passed through a number of cycles, generally increasing in areas and time periods that had abundant natural resources, and decreasing during long periods of scarce resources.

The introduction of the horse in the 1700s and early 1800s increased people's ability to collect and store food, increasing native populations. In the 1800s, diseases introduced by European settlers and missionaries significantly reduced native populations by as much as 90 percent in large regions in the project area. This decimated societies and cultures.

By the 1860s, the Oregon Trail and military roads opened the way for mass Euroamerican settlement, and Indian people were no longer the majority population in the project area. The culture and philosophy of these new people were quite different from the native people's system of seasonal migrations and interdependence with natural resources. In general, the new Americans settled in one place year-round, which created different impacts on the landscape compared to the seasonal migratory patterns of American Indians.

Native people set fires to modify their environment at certain times of the year. These fires differed in intensity, timing, and location from current fires in project area ecosystems. The new settlers introduced additional disturbances to native systems, including sheep and cattle grazing, large-scale resource extraction, and fire suppression, among others. Specific modifications to native systems are described briefly in the introduction of this chapter, in more detail throughout this chapter, and in still greater detail in the Science Integration Team's Scientific Assessment (Quigley and Arbelbide 1996).

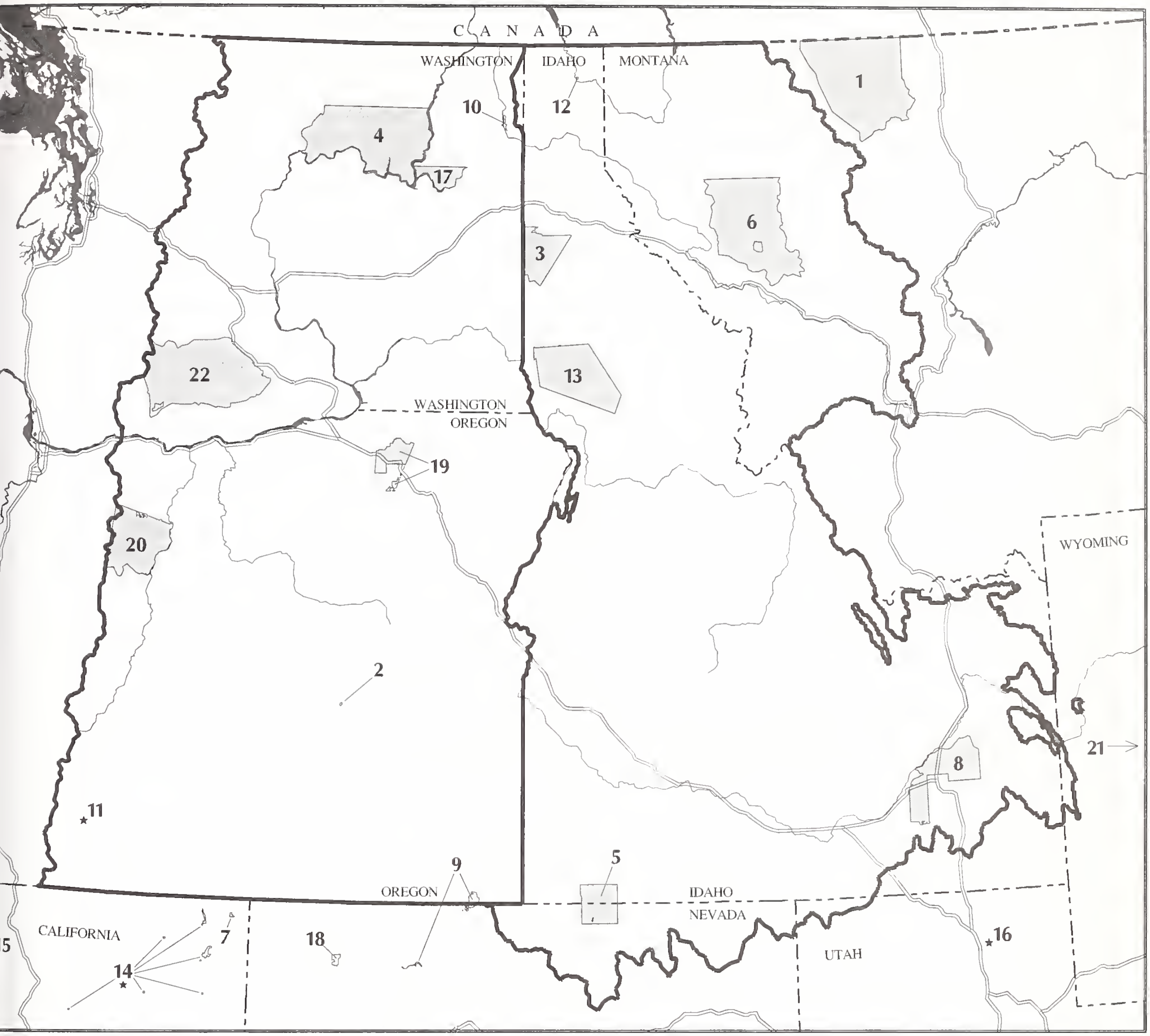
Land uses and seasonal migration patterns for Indian people were altered as a result of the influx of new settlers with new cultures. The steady growth of Euroamerican populations caused conflicts over resource use and availability, as well as pressure to change American Indian cultures.

The competition and conflict between native and Euroamerican people in the 1800s resulted in a treaty-making period between tribes and the United States Government. Treaties are agreements between sovereign nations and are considered the supreme law of the land in the United States Constitution (Article VI). When the Federal Government signed treaties with American Indians, it assumed a legal obligation in which the Indians trusted the United States to fulfill commitments given in exchange for cessation of Indian claims to land.

In signing treaties, most tribes ceded lands in exchange for set-aside, exclusive-use reservations (map 2-31), services, and promises of access to traditional land uses such as hunting, fishing, gathering, and livestock grazing. The tribes hoped this would preserve their cultural and subsistence activities and traditional economic lifeways for current and future generations. Indian reservations were seen by both tribes and the Government as a way to limit conflicts and allow tribes to have their own land.

American Indian use of the land became restricted by removal from their homelands and a shift onto Indian reservations. Many tribes lost their ability to remain self-sufficient because they were deprived of a land base large enough to supply a subsistence, and they became dependent on Federal Government assurances in the treaties. Bands, communities, and even families were divided among reservations, often further separating them from their traditional use areas and resources. However, many Indians continued off-reservation use of their homelands, and some even maintained off-reservation communities.

Traditional lifeways persisted even as the Indians increasingly conformed to regional non-Indian lifestyles. The largely separate reservation communities often imitated and interacted with counterpart, non-Indian communities. Even the internal conflicts and divisions that accompanied cultural changes were limited by social forces based on family ties, a shared heritage, and cultural background. These same factors bound people and their communities to certain off-reservation lands.



Map 2-31. Federally Recognized Tribes

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996

50 0 50 100 150 miles

50 0 50 100 150 km

N

	Tribal Lands	5	Duck Valley	14	Pit River
	Major Rivers	6	Flathead	15	Quartz Valley
	Major Roads	7	Fort Bidwell	16	Shoshoni NW Band
	EIS Area Border	8	Fort Hall	17	Spokane
*	Tribal Headquarters	9	Fort McDermitt	18	Summit Lake
1	Blackfeet	10	Kalispel	19	Umatilla
2	Burns Paiute	11	Klamath	20	Warm Springs
3	Coeur d'Alene	12	Kootenai of Idaho	21	Wind River
4	Colville	13	Nez Perce	22	Yakama

American Indians seasonally sought out familiar resources and places, regardless of ownership. They developed understandings with landowners and trade opportunities with those communities they encountered. During economically depressed periods, such as the Great Depression, renewed reliance on traditional foods and other practices helped sustain many tribal economies. Inevitable conflicts over land use led to reduced tribal access to resources and traditional places.

American Indians changed along with regional developments and governmental regulations. For example, many Indian families came to depend increasingly on automated modes and routes of travel. Various new Federal agencies' management actions and policies for public lands in the early 1900s have changed and continue to change American Indian uses of lands in many ways. By the mid-1900s, the effect of assimilation policies and influences caused traditional cultures and values to become narrower aspects of American Indian life. Most traditional uses of public lands today, however, continue to have roots in earlier native cultures and socio-economic practices.

Legal Agreements

Federal Trust Responsibility

The trust responsibility is difficult if not impossible to define. Pevar in his book says "The Federal Government obligation to honor its trust relationship and fulfill its treaty commitments is known as its trust responsibility" (Pevar 1992). The legal concept known as "trust" originated in England in the Middle Ages. It meant that ownership of land placed in trust was in the hands of one person, the trustee, who had the responsibility to manage the land for the benefit of another person, the beneficiary.

The modern concept of trust responsibility grows out of the 1814 Treaty of Ghent, in Chief Justice Marshall's decision in *Cherokee Nation v. Georgia* 1831. Justice Marshall characterized American Indian tribes as "domestic dependent nations" involving (1) the government or nation-state status of tribes, and (2) a special tribal relationship with the United States (Cohen 1982). Marshall described the trust relationship as one that "resembles that of a ward to his guardian." This relationship has been consistently recognized by Federal courts ever since and has been described as "special," "unique," "moral," and "solemn" (Indian Tribes 1981).

In addition, the rights reserved by the tribes in treaties and agreements, or which were not expressly terminated by the Congress, continue to this day. These governmental rights and authorities extend to any natural resources which are reserved by or protected in treaties, executive orders, and Federal statutes. The courts have developed the Canons of Construction, guiding premises, that treaties and other Federal actions "should when possible be read as protecting Indian rights in a manner favorable to Indians (Cohen 1982).

The interpretation of tribal rights and treaty language continues to evolve and define Federal legal responsibilities. For example, a 1994 court decision involving shell fishing rights determined that treaty-reserved resources were not limited to those actually harvested at treaty time because the right to take any species, without limit, pre-existed the treaties (*United States v. State of Washington* 1994).

The primary focus of the Federal Government trust responsibility is the protection of Indian tribes' natural resources on reservations, and the treaty rights and interests that tribes reserved on off-reservation lands. In fulfilling the trust obligation, the Congress also adopted laws and policies that protect tribes' rights to self-determination, and promote the social well-being of tribes and their members. Under various laws and policies, agencies have a responsibility to implement Federal resource laws in a manner consistent with a tribes' ability to protect their members, to manage their own resources, and to maintain themselves as distinct cultural and political entities. These responsibilities can be readily applied to resources and lands administered by the Forest Service and BLM. Forest Service and BLM trust responsibilities apply to those actions under their authority. For example, they can affect activities on lands they administer relative to plant and animal habitats.

The Federal Government trust responsibility compels agencies to conduct their activities consistent with obligations set forth in treaties and statutes. In carrying out their trust

responsibilities, the BLM and Forest Service must assess proposed actions to determine potential impacts on treaty rights, treaty resources or other tribal interests. Where potential impacts exist, the agencies must seek consultation with affected tribes and explicitly address those impacts in planning documents and final decisions. Consultation with the tribes, described later in this section, is essential in carrying out that trust responsibility. A key issue is the Federal government's trust obligation to ensure that tribal treaty rights and interests will be protected. Agencies often consider that trust is carried out when tribal interests have been considered prior to making land use decisions. However, consultation and consideration in and of themselves may not be enough to fulfill Federal trust responsibilities. Tribes contend that treaty resources must actually be protected before land management activities can proceed. Despite the legal disputes between processional duties associated with project decision-making processes and substantive duties consisting of guarantees, Federal fulfillment of trust is ultimately measured by the actual effects of Federal actions.

Meeting the purpose and need for action as described in Chapter 1 of restoring and maintaining the long-term ecosystem health and integrity on the lands administered by the Forest Service or BLM, while still supporting the economic and/or social needs of people, cultures, and communities at sustainable and predictable levels of products and services from those lands, is consistent with, if not equal to, meeting the government's Federal trust responsibilities.

Other Agreements

Although the treaty-making era ended in 1871, negotiations with tribes continued and resulted in agreements ratified by both houses of Congress. Like treaties, agreements and statutes are the supreme law of the land, creating rights and liabilities that are virtually identical to those established by treaties (Cohen 1982). Executive orders were signed in the late 1800s and early 1900s with the intent to reserve lands for tribal use, identify certain services, and occasionally to identify rights for non-treaty tribes. With regard to the applicability of the basic trust doctrine, Congress has not drawn distinctions between treaty and non-treaty tribes (Cohen 1982).

Tribal Governments

Tribal governments have broad social and natural resource responsibilities toward their membership and often operate under different cultural and organizational goals than Federal agencies. Enrolled tribal members are entitled to exercise those reserved rights and benefits held by a tribal government, but are subject to tribal government regulations. Differences in the character of tribal organizations exist among tribes based on how they were given Federal recognition, provided reservations, and whether they adopted the Indian Reorganization Act of 1934. This act encouraged tribes to organize themselves under formal constitutions approved by the Federal Government.

Tribes have interest in reservations (owned communally by a tribe), Indian allotments (owned by an individual), and off-reservation lands, where no legal title to the land remains; however, the nature of interest and legal rights varies. Some tribes have a legal right to fish at all usual and accustomed places (specified in treaties) for both on and off-reservation ceded lands, regardless of property ownership.

In the past, the Bureau of Indian Affairs (BIA) represented virtually the entire governing authority over Indian tribes, including housing, schooling, and various other aspects of their social structure. The Self-Determination and Education Assistance Act, passed in 1975, authorized the tribes to contract to operate BIA programs. Since then, the act has been amended three times (1988, 1991, and 1994), giving participating tribes even broader authority to manage and operate Bureau of Indian Affairs and other Department of interior agency programs.

Tribes' traditional and complex cultural ties to public lands still generate tribal concerns on how those lands are managed. Tribal governments, now with enhanced governing authority, directly address the broad social and natural resource concerns of their citizens. Most tribes have evolving internal organizations and deliberative skills to deal with land

management agencies. Many are asking Federal agencies to take a more proactive role on their behalf, especially in areas of treaty rights, trust resources, and ecosystem health.

Current Federal Agency Relations

The existing relationships between tribes and Federal agencies have evolved rapidly in the past three years. Empowerment of tribal governments and numerous Federal court cases involving treaty-reserved fishing rights in the past two or three decades are partially responsible. The momentum to advance Federal agency-tribal relations in the project area has increased since 1993. This evolution responds to new legal interpretations, legislation, executive orders, and departmental direction that encourages acknowledgment of tribal government issues, government-to-government consultation, and resolution of tribal concerns through consensus-seeking approaches. A chronology of these events can be found in Appendix C.

Current Forest Service and BLM relations with tribes vary across the project area. The frequency of agency-tribe contacts often depends more on the nature of an established relationship than on whether an agency is proposing actions with potential effects on tribal interests. When an agency such as the BLM or Forest Service initiates an action, such as developing this EIS, the agency consults with affected American Indian tribes. Agencies tend to consult only those tribes which have overlapping ceded lands or neighboring reservation lands, although affected Indian groups are those with interests in land management action(s)—even if they are non-federally recognized American Indian communities.

Federal law requires the BLM and Forest Service to consider tribal interests when conducting actions that may affect natural resources on tribal lands and/or the socio-economic well-being of its people. Examples of these interests and assets include, but are not limited to, air quality, water quality and quantity, anadromous fish runs, migrating wildlife, and cultural and religious interests of the tribe. Agencies must carry out their activities in a manner that protects Indian trust assets, avoids adverse impacts when possible, and mitigates impacts where they cannot be avoided. Federal policies also require explicit discussion and consideration of Indian trust assets in environmental assessments and impact statements (Columbia River System Operations Review FEIS 1995).

American Indian Issues

"Secretarial Order No. 3175 and Executive Order 13007 directs agencies to consult with potentially affected tribal governments concerning possible impacts on tribal interests and to explicitly address anticipated effects in the planning, decisional and operational documents that are prepared for the project. Agencies are also directed by the Secretarial Order to consult with the Bureau of Indian Affairs and the Office of the Solicitor if any impacts on tribal interests are identified. The following issues have been identified and assessed through implementation of such an approach since December 1993.

Many tangible and intangible resources and values that interest American Indians are the same as those that interest members of the general public, which are described in Appendix D and summarized in Chapter 1. Some issues are unique to American Indians because of tribal interests, land ownership, and other characteristics that are different from those of the general public. Many of these issues are complex and often sensitive, and each tribe emphasizes issues specific to its interests. Although many of these issues are similar among tribes, how they would like them addressed by land management agencies may vary. A number of Federal agencies have developed revised policies to respond to Indian issues. Tribal expectations are defined and understood through consultation.

Trust Obligation

The most fundamental tribal issue identified during the course of the project involves differing perceptions between the tribes and the Federal Government regarding "trust obligations" of the Federal government in regard to off-reservation settings. The U.S. courts have been reluctant to define the precise scope of the Federal-Indian trust relationship. Tribes consider the trust obligation as a substantive duty, one that should ensure protection of tribal interests on public lands as

well as trust lands, or at least an adherence to a policy of prioritization in which protection of tribal interests enjoys a standing priority over certain forms of other interests. Tribes contend that the Federal land management agencies have not historically and currently manage natural resources in accordance with Indian treaty rights or Federal trust responsibility. Tribes assert Federal agencies must exercise their authorities in a manner which will protect and restore the habitat needed to support resources on which meaningful exercise of treaty rights depends.

Because trust responsibilities remain undefined, agencies are unsure when a responsibility is met. Therefore, the Federal interpretation of trust obligations primarily focuses on a procedural duty in which protection of treaty rights and tribal interests is taken into account by the agencies commonly through a government to government consultation process with tribal governments. This interpretation of trust responsibilities has been recently identified in Department of Interior Manual release 512 DM 2 (December 1, 1995). The Department of Agriculture has similar policies expressed in Departmental Regulation No. 1020-6 (October 16, 1992). Agencies must identify if any proposed activity poses an impact on Indian interests on public or trust lands, ensure such impacts are explicitly addressed, consult with affected tribes and document potential conflicts fully incorporating tribal views, and explaining how a decision is consistent with the Government's trust responsibility. Resources located outside reservation boundaries are considered "in common" resources in regard to treaty rights, hence considered as "treaty resources" rather than "trust resources." From this Federal perspective, off-reservation resources of interest to tribes may be subject to competing and conflicting uses which in some circumstances may be more compelling and supersede the tribal rights and interests. Aside from these divergent legal interpretations, treaty rights and trust obligations do serve to establish a unique inter-governmental relationship requiring at minimum that Federal agencies must identify tribal interests and needs and fully account for these in their decisions.

Consultation/Participation

As noted above, the intergovernmental consultation process serves as the primary means for the Federal agencies to carry out their trust obligations. Historically, agencies, when they have attempted to consult with tribes, have pursued consultation on the agencies' perception of what consultation constitutes. In sum, consultation is often an ill-defined, erratically implemented process at best. In actuality there are as many definitions for consultation and fulfillment of trust as their are Indian nations. For that reason, consultation is conducted with each tribe individually. For example, the Confederated Tribes of the Umatilla Indian Reservation define consultation as a formal process of negotiation, cooperation and policy-level decision-making between sovereigns on a government to government basis aimed at reaching mutual decisions that will protect tribal lifestyle, culture, treaty rights, religion and economy. Tribal governments cannot formally consult on every site-specific federal project. Thus policy level decision making that will be applied to all projects must ideally occur. A need exists for government to government coordination to establish mutually agreeable procedures.

While most tribes appreciated the direct contact with ICBEMP staff and project leaders, many tribes feel they should have had a more integral role in the whole ICBEMP process, with tribal scientist involvement and tribal participation in development of alternatives. Funding was identified as one factor in this failure. The tribes assert that the agencies are not meeting their trust responsibilities because of not funding tribal participation. From the tribal perspective, effective project participation must include participation in the project implementation process as well with full representation on intergovernmental oversight groups that may be established.

Community Well-Being

Project area tribal issues need to be viewed relative to agency effects on Indian reservations and allotments, ceded lands, traditional homelands, areas of tribal interest, and areas of mutual interest with other tribes; cultural survival; treaty rights; trust assets and resources; American Indian religious practices; cultural heritage resources and places; and tribes' socio-economic well-being. Tribal community health and well-being are based on a number of factors, including economic growth, freedom to pursue traditional uses of the land, effective trust relationship with the federal government, and

lack of infringements on religious practices. Shortfalls in any of these areas can lead to effects on community well-being, and may be reflected in social measures such as unemployment, substance abuse, and suicide.

Sensitive Tribal Species

The availability of culturally significant species and access to socially and/or traditionally important habitats (ethno-habitats) support the well-being of Indian communities as many social, cultural, and economic activities center on the harvest, preparation, trade, and consumption of such resources. The occurrence of culturally significant species can be predicted through their known associations to types of landscapes and habitats. The presence and health of ethno-habitats can be assessed by using ecological information and the cultural expertise of a tribe and traditional users. The degree of access to resources and places can be determined by examining the potential effects of physical obstacles, administrative barriers, and/or behavior constraints that management actions may impose.

Restoration

Restoration of native species' habitats is central to many tribal interests. However, the tribes have asserted that "restoration" means many things to many people. Consequently, the tribes wish to see that a definition of restoration be developed, then objectives and standards be written to implement restoration activities. However, the tribes have voiced concerns that the ICBEMP concept of restoration includes more habitat degradation, for example sacrificing fish and wildlife values in efforts to restore an historic mix of tree species. The tribes are concerned that timber and grazing activities still predominate land management considerations to the detriment of other resources. Many tribes are dissatisfied with the lack of adequate protection measures and absence of restoration in PACFISH (from which much of the aquatics strategies are derived). There is great concern that what comes out of the ICBEMP will be even <u>less</u> protective than PACFISH. Most Tribes have their own restoration plans, the Upper Grande Ronde Plan is an example. They assert that significant restoration of degraded habitats must occur before other land use activities that would degrade the habitat are allowed.

Tribes contend that the Federal trust responsibilities and statutes require the development and adoption of an alternative that allows unimpeded recovery of all damaged habitats and complete protection of high quality habitat. In regard to riparian protection, measures are recommended including: (1) provision that only actions that have low risk be allowed in riparian areas; (2) prohibition of new roads, logging or mining, in riparian areas; (3) suspension of grazing until habitat standards are met in watersheds; (4) establishment of riparian reserves as actual land allocations in agency land use plans; and (5) creation of minimum buffers, such as the lesser of 300' slope distance from floodplain or top of topographic divide on all streams (Classes I-IV).

Tribes place emphasis on the analysis of cumulative effects, including: (1) assessment of ongoing impacts in watersheds resulting from current and past BLM/Forest Service land management activities; (2) full inventory of watershed/riparian conditions and activities, such as stream crossings, road density, grazing, mining, logging and estimated sediment delivery; (3) correlation of stream conditions with habitat standards based on surveys of all listed fish bearing streams; and, (4) suitability determination for grazing. In regard to the latter, tribes contend that agencies should not employ "Proper Functioning Condition" as a standard for grazing compatibility or riparian health.

Tribes assert that the real forest health crisis is associated with degraded conditions of watersheds, decreased salmonid populations, and loss of old growth ponderosa pine and general old growth structure, as opposed to current stand composition and fuel load conditions. They, therefore, believe that forest health should be re-defined as watershed health and emphasize the use of fire as a tool for changing stand conditions. The tribes are concerned that significant logging will occur under the name of salvage. Various tribes recommend no further cutting of larch and ponderosa pine. Salvage logging should be limited to small diameter, remain outside roadless and riparian areas, not develop new roads, and not enter after fire until the ecosystem is stabilized.

Place Attachment

Indian people have long held pronounced and special attachments to the land, which are understood and expressed through their relationships with culturally significant places. Consequently, traditional land uses usually occur in the context of culturally significant places, through which place attachments and values have become embedded elements in Indian cultures and religious beliefs. Tribal interests in the integrity of such places involve a range of area types: areas of interest, landscapes, traditional use areas and localities such as ethno-habitats, burial sites, and archeological sites. Cultural places may be valued at the community, tribal, and inter-tribal levels.

Harvestability

The health and availability of resources are of great interest to American Indian cultures. A key issue raised by tribes for this project relates to sustainability of tribally sensitive species and involves the concept of "harvestability" which serves as an expansion on Federal concepts of species "viability." A difference of opinion exists between the Federal Government and tribes regarding what constitutes "harvestability."

The tribes assert that the BLM/Forest Service must comply with Federal obligations under the Pacific Salmon Treaty and *U.S. v. Oregon* as well as the rebuilding goals established by the Northwest Power Planning Council and conformance with the Clean Water Act, NFMA, and ESA. The Columbia River tribes seek agency conformance with the Tribal Restoration Plan which contains specific, quantified objectives. The tribes make use of "harvestable" species population to define a desired level of harvest for subsistence, commercial, spiritual and cultural needs. Harvestable populations of salmonids and other fish, wildlife and plant species important to the tribes must be the goal of any adopted alternative. Harvestability, in this manner, constitutes a tribal desired future conditions. The Forest Service management responsibilities are to provide for "viable populations" of existing native and nonnative vertebrate species. The determination of a "viable population" level also defines the level of escapement required for conservation purposes, which in turn is used to determine the "harvestable population." Certainly, the disparity between viability and harvestability is most critical for anadromous fish species as opposed to terrestrial big game and cultural plant species. The extent to which there may be a legal obligation imposed on the Federal Government to provide habitat capable of supporting "harvestable" levels of resources from the public lands is not an issue which will be resolved in this document. Information and population trends for a sample of species of concern are shown in Table 2-19.

Cultural Resource and Cultural Practices Protection

Agencies and tribes offer differing definitions for cultural resources as addressed in Chapter 2. In addition to protection of archaeological sites, agencies should include efforts to rehabilitate gathering sites and restore native plant communities and restore watershed health and function by meeting minimum legal requirements such as water quality standards. In addition, tribes have requested that all Forest Service and BLM administrative field offices develop and implement agreements on implementing legal requirements for cultural resource protection (such as NAGPRA, NHPA and ARPA), including plans for locating and evaluating Traditional Cultural Properties (pursuant to NPS Bulletin 38) under Section 106 of NHPA, and allow for full participation of tribes in performance of cultural resource inventories.

Accountability

Tribes consider that the draft ICBEMP standards and objectives give too much flexibility to local decision makers to do activities that may damage aquatic and other resources to which the tribes retain rights or interest. Leaving development of objectives and standards to site-specific projects, or allowing changes in the standards and objectives following watershed analysis, leads to subjective, inconsistent decision making that can result in further degradation. Consequently, tribes assert that standards must be enforceable, measurable and accountable, rather than simply advocating more assessment processes. Tribes contend that standards must ensure full protection of high quality habitat and restoration of degraded habitat. Such standards for fish habitat should include threshold values for substrate, bank

stability and water temperature that require management changes needed to meet these standards, such as foregoing and suspending activities that retard attainment in watersheds where standards are not met.

Consultation

Consultation is not a single event, it is a process that leads to a decision, for example, the Record of Decision for this EIS. Consultation means different things to different tribes. It can be either a formal process of negotiation, cooperation, and policy-level decision-making between tribal governments and the Federal Government, or a more informal process. Tribal rights and issues are discussed and factored into the decision. Consultation can be viewed as an ongoing relationship between an agency (or agencies) and a tribe (or tribes), characterizcd by consensus-seeking approaches to reach mutual understanding and resolve issues. It may concern issues and actions that could affect the Government's trust responsibilities, or other tribal interests.

Consultation serves at least five purposes:

- to identify and clarify the issues,
- to provide for an exchange of existing information and identify where information is needed,
- to identify and serve as a process for conflict resolution and,
- to provide an opportunity to discuss and explain the decision.
- to fulfill the core of the Federal trust obligation.

Legal requirements for federal agencies to consult tribes and American Indian communities has its basis in federal law, court interpretations, and executive orders (see Appendix C).

Table 2-19. Species Population Trends in the Project Area.

Species Name	Population Trend	Regulation	Comments
Anadromous salmonids	Declining	Federal, state, and tribal	Primary cause for decline is due to human-caused effects on habitat from hatcheries, dams, and harvests. Some species are currently listed as threatened or endangered, such as Snake River sockeye, and spring and fall chinook salmon.
Resident salmonids, whitefish	Declining	Federal, state, and tribal	Primary cause for decline is human-caused degradation of headwater and main-stem habitat and hatchery influences. Research on metapopulation interactions of species is still needed.
Sturgeon, lamprey	Declining	Federal, state, and tribal	Main-stem hydroelectric dams have changed free flowing systems into slack water environments, and these dams impede local migration. Much information is still needed on these species. Freshwater habitat degradation is thought to have a negative effect.
Sucker, sculpin, mussel	Unknown	Federal, state, and tribal	Detailed, accurate information is lacking on many of these species. Species endemic to portions of the project area are facing immediate threats to survival because of poor recruitment and water rights issues.
Mule deer, elk, black-tailed white-tailed deer, pronghorn, and moose	Significant increase from over-hunting in late 1800s. Current populations stable. White-tailed deer and and elk increasing range. Pronghorn and moose recovering some lost historic range.	State and tribal for hunting numbers and seasons	In general, these ungulates have increased due to control of commercial hunting in the late 1880s and their adaptability to early seral vegetation and edge habitat created by logging. Intensive management of habitat, as well as control over harvest, have increased populations. Roads, dogs, fire management, urban sprawl into winter ranges, poaching, and grazing competition with livestock are all concerns which could cause declining populations in the future.
Mountain goat	Declining populations, although historic range has increased into other habitats.	State and tribal for harvest	This species was impacted by competition for forage from domestic sheep and trophy poaching. Forage has not regenerated well due to fire suppression.
Bighorn sheep	General decline from historic populations, although some local gains in recent decades.	State and tribal for harvest	Bighorn sheep have declined due to disease transmission from domestic sheep, conifer encroachment, and fragmentation of seasonal range by roads and houses. They have also been impacted by competition for forage from domestic sheep and trophy poaching. Forage has not regenerated well due to fire suppression.

Table 2-19. Species Population Trends in the Project Area (continued).

Species Name	Population Trend	Regulation	Comments
Grizzly bear, gray wolf	Declining since the mid 1800s to near extinction. In the past 30 years, increasing due to protection and immigration from Canada. Populations stable.	Protected by U.S. Fish and Wildlife Service as threatened (grizzly) or endangered (gray wolf)	Grizzly bears are isolated in large blocks of relatively undisturbed moist and cold forest in northern Washington, Idaho, Montana, and the Yellowstone ecosystem. Wolf populations are increasing in the same habitat areas and starting to move into other habitats in northern portions of the project area. There is concern for poaching, public fear of predators, road access to habitat, prey base stability, isolation of populations, and conditioning of predators to human foods and livestock.
Black bear	Variable by state. Some states have changed hunting regulations, and populations have increased. Stable elsewhere.	State and tribal for harvest	Black bears are habitat generalists and have benefitted from early seral vegetation and edge habitat created through logging. Population trends are not well known, nor is the impact of baiting, human conflicts, and harvest. Fire suppression and changes in berry production and habitat structure may impact bears. Competition between bears and domestic sheep for vegetation is a concern.
Jackrabbit, Nuttail's cotton-tail, pygmy rabbit, snowshoe hare, sage grouse, sharp-tailed grouse, marmot	Decreasing	State for harvest	Significant decline in shrub steppe and desert salt shrub communities, along with exotic species invasion and livestock grazing, have seriously decreased forage and cover for grouse and rabbits. Snowshoe hares have been impacted by fire suppression and decreases in young lodgepole pine, riparian shrub, and hardwood stands.
Forest grouse (blue grouse, spruce grouse, and ruffed grouse)	Decreasing	State and tribal for harvest	Fire suppression, increasing stand density, decreasing shrub and riparian vegetation, and a decreasing large tree component have all impacted blue and spruce grouse. Ruffed grouse may be increasing in dense mid-seral stands, but there is a lack of data.
Bald eagle, golden eagle, other raptors, Swainson's hawk, ferruginous hawk	Most are increasing. Rangeland hawks decreasing due to conflicts for winter range.	U.S. Fish and Wildlife Service and tribal	Raptors that declined due to pesticide use and human mortality have generally increased with regulation of pesticides and public education. Decline in the large tree component; old-forest, open stand structure; and prey species is still a concern. Swainson's and ferruginous hawks and others dependent on large open areas have declined due to conflicts in winter range.
Canada goose, ducks, coot, heron, swans	Geese are increasing. Ducks declined until a recent upward trend.	State, tribal, and U.S. Fish and Wildlife Service	Canada geese have responded well to artificial nest boxes, grazing, agriculture, and domestic grasses. All waterfowl have been impacted by a decline in wetlands, de-watering, lead shot, disease, and poaching.

Bitterroot, biscuitroot, mariposa, yampah	Stable, some locally impacted.	Tribal	Scabland species are generally not affected by livestock grazing or fire. Some areas are impacted by road construction and other ground disturbances. Some local losses noted for mariposa and yampah from past intensive grazing. Grazing time can conflict with tribal gathering practices.
Willows, tules, cattails, wocas (lilypods), wappatoo	Decreasing	EPA, U.S. Fish and Wildlife Service, and tribal for wetlands	Degradation and loss of riparian and wetland habitat due to grazing, timber harvest, dewatering, mining, and roads have all caused declines in these species.
Camas, yampah, beargrass	No data	Tribal	In general, upland herblands and meadows have decreased due to fire suppression, grazing, conifer encroachment, soil disturbance and compaction due to logging, and exotic species invasions. Impacts on herbs from historically heavy sheep grazing are gradually showing recovery.
Mushrooms, elephant ears, morels, and other fungus sporocarps and beargrass	Unknown, wild mushrooms are a product of diverse and complex interactions within natural ecosystems.	Federal and state (wild mushroom harvesting falls under tribal regulation)	Commercial mushroom harvest, land management activities, and catastrophic events such as fire, disease, and insect epidemics all play a role in fungi productivity. There has been an increase in the harvest of special forest products and conflict with tribal gathering practices. There is a need for long-term study and monitoring of many commercially harvested species to understand their role in the productivity of ecosystems.
Huckleberry, elderberry, buffalo berry	Decreasing	Some units limit huckleberry gathering	These species and other forested shrubs have declined due to suppression of fire, grazing, increased stand density (limiting light, water, and climate), and competition for harvest.
Chokecherry, serviceberry	Variable. Serviceberry expanded in some areas, but age and structure diversity is lower. Chokecherry in riparian areas has declined.	None	Changes to berry production and other qualities important to tribes are unknown. There have been increases in chokecherry harvests by the public. Increasing ages of shrubs due to fire suppression is a concern.
Juniper	Increasing in distribution, but decreasing structural diversity.	None	Juniper has invaded other habitat types and stands have become denser, older, and less diverse with fire suppression and livestock grazing
Mountain mahogany	Declining	None	Mountain mahogany is declining in some places and not regenerating. Stands are becoming older and lack structural and age diversity. Some areas are heavily browsed. Research on regeneration is needed.

Integrated Summary of Forestland, Rangeland, and Aquatic Integrity

Key Terms Used in This Section

Cluster ~ In this EIS, refers to a group of sub-basins denoting forestland and rangeland ecosystems where the condition of the vegetation and ecological functions and processes are similar, and where management opportunities and risks are similar.

Ecological integrity ~ In general, ecological integrity refers to the degree to which all ecological components and their interactions are represented and functioning; the quality of being complete; a sense of wholeness. Absolute measures of integrity do not exist. Proxies provide useful measures to estimate the integrity of major ecoststem components (forestland, rangeland, aquatic, and hydrologic). Estimating these integrity components in a relative sense across the project area, helps to explain current conditions and to prioritize future management. Thus, areas of high integrity would represent areas where ecological function and processes are better represented and functioning than areas rated as low integrity.

Subbasin ~ Equivalent to a 4th-field Hydrologic Unit Code (HUC), a drainage area of approximately 800,000 to 1,000,000 acres.

Subwatershed ~ Equivalent to a 6th-field HUC, a drainage area of approximately 20,000 acres. Hierarchically, subwatersheds (6th-field HUC) are contained within a watershed (5th-field HUC), which in turn is contained within a subbasin (4th-field HUC). This concept is shown graphically in Figure 2-2 in Chapter 2.

Strongholds (fish) ~ Watersheds that have the following characteristics: (1) presence of all major life-history forms (for example, resident, fluvial, and adfluvial) that historically occurred within the watershed; (2) numbers are stable or increasing, and the local population is likely to be at half or more of its historical size or density; (3) the population or metapopulation within the watershed, or within a larger region of which the watershed is a part, probably contains at least 5,000 individuals or 500 adults.

Introduction

Unless otherwise noted, information in this section is based on the *Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia Basin and Portions of the Klamath and Great Basins* (Quigley et al. 1996a) and a more detailed paper describing the integrity work (Sedell et al. on file at the Walla Walla Office of the ICBEMP).

Up to this point, Chapter 2 has presented background descriptions of historical and current conditions of various components and processes in the project area. Information on forestland, rangeland, and aquatic ecosystems was organized by potential vegetation groups or watersheds and summarized by ecological reporting unit (ERU) where possible.

While ERUs provide a convenient way to summarize initial scientific information by geographical area, understanding the bigger picture across a large, complex landscape requires a more integrated summary to show how the existing conditions relate to each other and to identify where overall ecological conditions, opportunities, and risks are similar. To provide this integrated picture, the Science Integration Team evaluated all the information available and summarized current conditions around groupings or "clusters" of 4th-field Hydrologic Unit Codes (HUCs), also known as subbasins. (See Introduction to Chapter 2, and table 2-13 in the Aquatics section for more information on HUCs. See maps 2-32 and 2-33 later in this section for maps of clusters.)

Each subbasin was rated for various levels of "integrity" from separate aquatic, terrestrial, and hydrological viewpoints. These viewpoints, or integrity layers, were then analyzed together, or integrated, to provide a more unified view. This effort revealed groups or clusters of subbasins that exhibit a similar set of conditions or characteristics, reflecting a common management history; terrestrial and aquatic conditions, and management needs, opportunities, risks, and conflicts.

The integrated cluster summaries provide a project-wide context for the EIS Teams to tailor alternatives and evaluate their effects on a more site-specific scale (a few million acres) within the 144-million-acre project area. The cluster analysis also provides a context for evaluating cumulative effects. The information will help provide a context for land managers to set priorities and assess opportunities to contribute goods and services to the nation, by answering relevant questions such as:

- ◆What is the current condition of the project area?
- ◆Where are the areas in the best or worst shape?
- ◆Where are forestlands and rangelands least departed from (most similar to) historical conditions?
- ◆Where are fish communities and/or species most connected?
- ◆Where are the healthiest watersheds from a hydrological perspective?
- ◆What opportunities and risks present themselves on the current landscape for future management?

Measuring Integrity

Precise definitions of "integrity" or wholeness of a system do not exist. Estimates of integrity are derived using proxies that represent the ecological functions and processes, and whether they are present and operating. In general, for the purposes of the Interior Columbia Basin Ecosystem Management Project, aquatic and terrestrial systems with "high integrity" were defined as those that consist of a mosaic of plant and animal communities, and have well connected, high quality habitats that support a diverse assemblage of native and desired non-native species that adapt to a variable environment. Measures were developed by the Science Integration Team using direct and indirect variables to indicate how much various elements have departed from historical conditions. For the purposes of this analysis, "high departure" signifies that an area is significantly different than the condition expected for its biophysical environment, and roughly indicates "low integrity."

In measuring integrity, the Science Integration Team looked primarily at landscape features and fish communities, because they encompass most of the significant planning issues that were identified through the scoping process. (See Chapter 1 for a description of the issues and the scoping process.) The emphasis on landscape features and fish provides a geographically explicit, ecologically-driven context for discussion of management alternatives. This approach allowed an evaluation of the range of integrity of forestlands, rangelands, watersheds, fish communities, and terrestrial habitats.

Landscape Features

- ◆*Potential vegetation* ~ how vegetation has changed through time, historic and current; how structure and composition changed through time.
- ◆*Fire and other disturbance regimes* ~ how fire and other disturbance regimes have changed; how they affect vegetation, aquatics, and other resources; and how they might respond to future management actions.
- ◆*Road densities* ~ degree of roaded access; how integrity relates to roads.
- ◆*Hydrologic function* ~ resiliency of watersheds to disturbance; degree of past management disturbance.

Fish Communities

- ◆*Connectivity* ~ how well current fish communities represent the full range of diversity and life histories; how well fish communities are still connected in high quality habitats (which also represents in part the condition of hydrologic systems and other aquatic species).

Integrity Layers

The following are the individual integrity layers developed by the Science Integration Team:

- **Aquatic systems with high integrity** (highly functional) were held to be those with a full complement of native fishes and other aquatic species, well distributed in high quality, well connected habitats. (See discussion of Watershed Categories in the Aquatic Ecosystems section of this chapter.) Category 1 Watersheds have the highest integrity; Category 2 Watersheds have intermediate integrity; and Category 3 Watersheds have the lowest integrity.

- **Hydrologic integrity** was measured on the basis of resiliency of watersheds to disturbance, and estimates of past management disturbances. Hydrologic resiliency (the ability to recover following impacts) was further rated according to degree of impact already incurred, the sensitivity of stream and riparian vegetation to impacts, and probable riparian area disturbance on rangelands. Areas with high hydrologic impact and high stream and riparian sensitivity are considered to have the lowest probable hydrologic integrity across the project area.

- **Forest ecosystem subbasins with highest integrity ratings** were those that are largely unroaded and comprised of moist and/or cold forest potential vegetation groups. Forest integrity measures included the percent in each potential vegetation group, proportion in wilderness, unroaded areas impacted by fire exclusion, and proportion of the area where fire severity increased and/or fire frequency declined significantly from historical to current times.

- **Range ecosystems with the highest overall integrity** ratings were those upland shrublands that are less developed, less roaded, and more remote. In addition to these measures, rangeland integrity was based on the proportion in dry grasslands and dry shrublands, and the proportion of area in cover types affected by encroachment of western juniper and big sage.

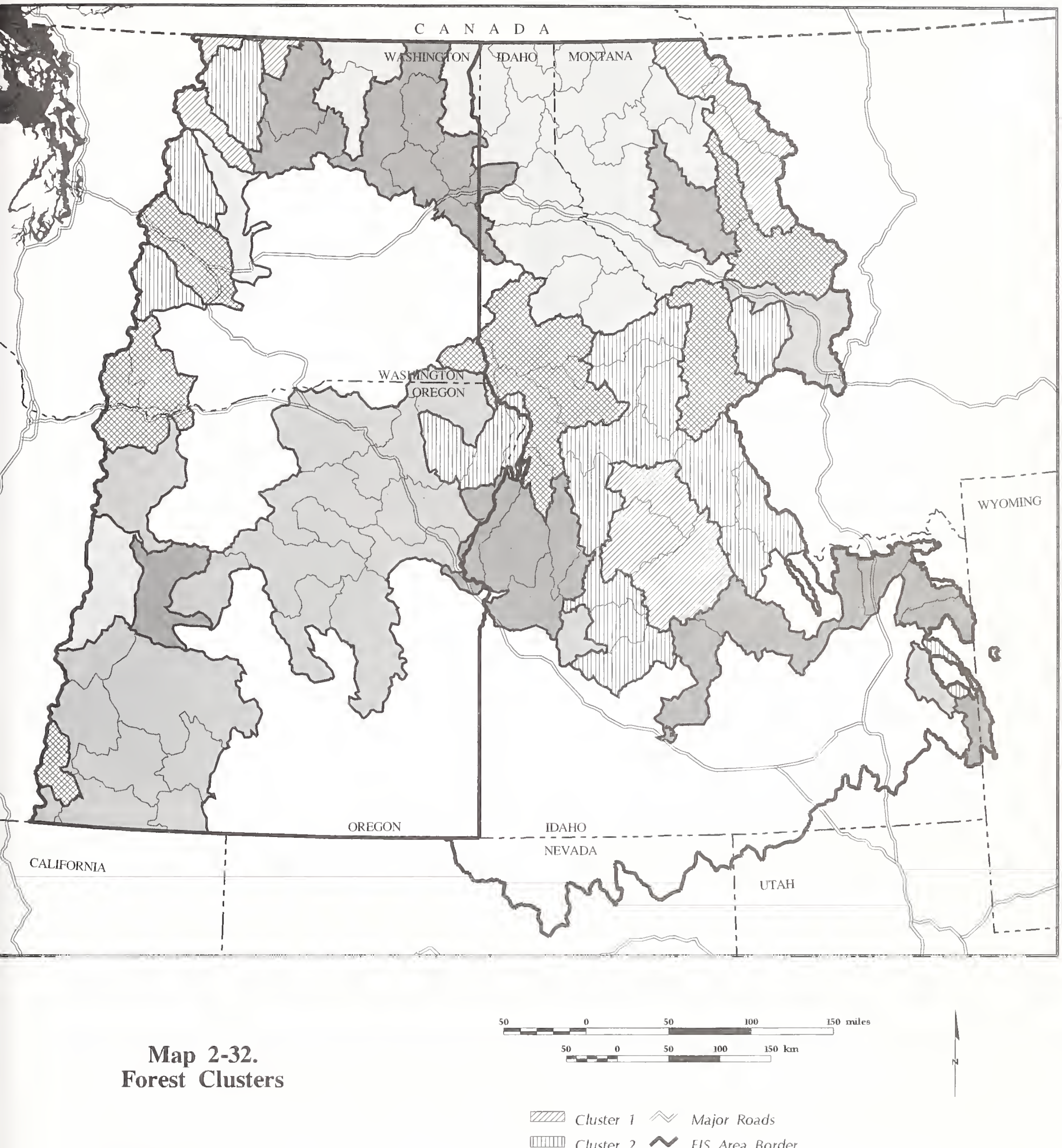
Terrestrial Habitat Departures

Departure values for terrestrial community types were developed to estimate the magnitude of broad-scale habitat changes in forestlands and rangelands within sub-basins. This was done to infer risks to current and future species viability. The availability of habitat within a sub-basin was compared to the historic range of conditions. It was assumed that species persistence within a sub-basin was not at risk if the current area of that species' primary habitat was within 75 percent of the data for historical condition. Risk to species persistence was assumed to increase substantially when current habitat availability fell below the 75 percent range of historical data, and persistence likelihood within a sub-basin was considered to increase as habitat availability exceeded the 75 percent range of historical data. Departure values were not determined for cropland, exotic, urban, alpine, rock, or riparian community types.

The Clusters

When the Science Integration Team analyzed individual sub-basin conditions (levels of integrity) together, several common patterns were revealed across the landscape. Six dominant clusters or sets of conditions focus on forestlands (sub-basins containing at least 20 percent forestland potential vegetation groups ~ dry, moist, and cold forests; see Map 2-32), and six clusters focus on rangelands (subbasins comprised of at least 20 percent rangeland potential vegetation groups ~ dry forest, dry grasslands, dry shrublands, cool shrublands, woodlands, riparian shrublands, and riparian woodlands; see Map 2-33).

The clusters are neither mutually exclusive nor all encompassing. Some subbasins contain both range and forested landscapes, which may be in very different ecological condition; where a sub-basin falls into both range and forest clusters, the implication is that the forest parts of that subbasin were evaluated as part of a "forest cluster," and the range parts of the subbasin were evaluated as part of a "range cluster" analysis. Some subbasins thus represent a clear set of conditions, while others are a mix of several conditions and risks.

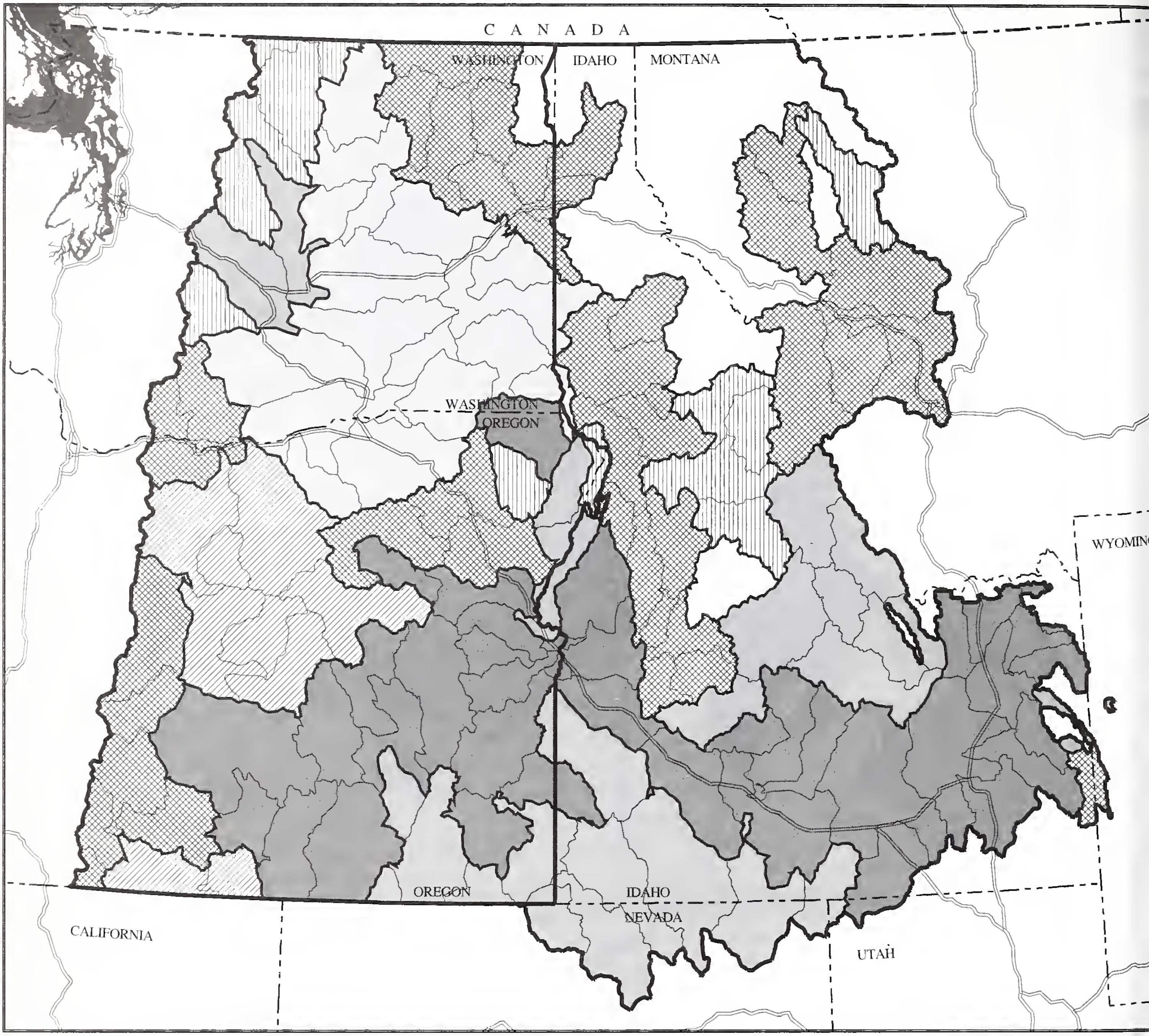


Map 2-32. Forest Clusters

BLM and Forest Service Administered Lands Only

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Project Area
1996

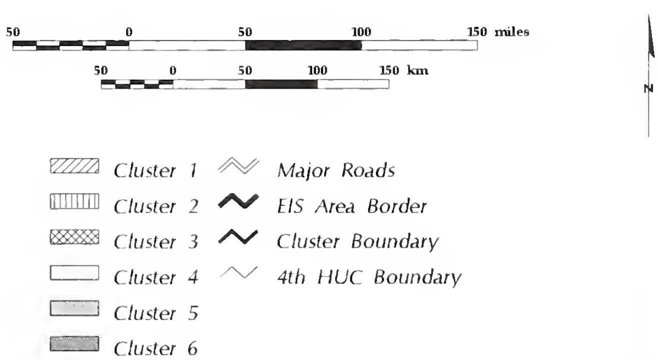


Map 2-33.
Range Clusters

BLM and Forest Service Administered Lands Only

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996



For the cluster analysis, conditions within forest clusters and range clusters are summarized for the entire landscape, including both terrestrial and aquatic components. Within any cluster, the predominant conditions are an average ~ some locations within the cluster may have specific conditions that are better or worse than what is indicated.

Forest Clusters

Subbasins with at least 20 percent of their area comprised of dry forest, moist forest, or cold forest potential vegetation groups were classified as forest clusters. Relationships among variables reflecting vegetative conditions, hydrologic sensitivity, and human-caused disturbance of native forests were studied to identify dominant patterns and differences. What emerged were six forest "clusters" of subbasins with similar conditions. Differences among clusters were summarized in terms of forest conditions, departures in terrestrial communities, implications for terrestrial vertebrate species, hydrologic conditions, aquatic community status, and opportunities for management. Abbreviated forest cluster descriptions follow.

Forest Cluster 1

Subbasins in Forest Cluster 1 represent those that are most intact ecologically, with the least loss of integrity in both forest and aquatic ecosystems. They are predominantly high elevation and tend to be dominated by wilderness or roadless areas, and by cold, or moist and cold forests.

Forest ecosystems in this cluster are the least altered, although forest structure and composition have been simplified primarily by fire exclusion. These subbasins have the lowest mean changes in fire frequency and severity.

Forest habitats in this cluster provide a relatively high degree of security for a variety of species vulnerable to human exploitation and/or disturbance. The decline of late-seral forest structures within moist and cold forests in Forest Cluster 1 has likely had detrimental effects on available habitats for species associated with those structures. Conversely, an increased area in early-seral structures has likely increased the abundance of primarily summer foraging habitat for many forest ungulates (big game species).

This cluster has the highest hydrologic integrity of any forestlands in the project area. All subbasins have high or moderate aquatic integrity, with the best overall fish conditions and the best watershed conditions. They support some of the largest blocks of watersheds supporting strong salmonid populations and high measures of fish community condition. Although introduced fishes are often present, they rarely dominate communities. Connectivity among watersheds supporting native fish strongholds is good, and strongholds for multiple species often exist in subwatersheds throughout these subbasins.

Forest Cluster 2

These subbasins tend to have a mix of areas of moderate-to-high forest and aquatic integrity. Moderate to large blocks of wilderness or roadless areas and cold or moist forests are associated with the best conditions. Whereas, roaded non-wilderness areas and dry and moist forests often coincide with more altered vegetation conditions.

Forests in these sub-basins tend to be moderately to highly productive. The headwater areas are likely to be primarily moist and cold forests with the least altered structure and composition. Changes have been more substantial at mid- and lower-elevation, dry and moist forests where road densities are moderate to high and fire regimes have changed from non-lethal to mixed and lethal.

Forests in this cluster provide relatively secure habitats for those species vulnerable to exploitation and/or human disturbance. Risks to species persistence likely have increased for terrestrial vertebrates that rely heavily on early- or late-seral structures, or for species that prefer small openings of non-forest, canopy gaps, or open understories. The overall decline of early-seral forest structures has probably reduced habitat availability for dry, moist, and cold forest species.

Hydrologic integrity of the forests within these sub-basins is relatively high. Subbasins have high or moderate aquatic integrity, with both strong and unproductive watersheds present. Blocks of strong and high integrity watersheds are associated with the wilderness and roadless areas. Fish populations show relatively little influence from introduced species and thus have good potential for long-term persistence.

Forest Cluster 3

Subbasins in Forest Cluster 3 are represented by aquatic ecosystems that are in relatively good condition, but forests that are in highly altered and poor condition. Wilderness or roadless areas play a relatively insignificant role, and roading is moderate to extensive. Forests in this cluster are dominated by moist and dry forest potential vegetation groups.

The moderately to highly productive forests in this cluster appear to have substantially changed structure, composition, and fire regime.

Terrestrial species vulnerable to human disturbance and/or exploitation have a relatively limited amount of secure habitat. Risks to species persistence have likely increased for terrestrial vertebrates that rely heavily on early- or late-seral structures, and for species that prefer small openings of non-forests, canopy gaps, or open forests. The overall decline of early-seral forest structures in dry and moist forest probably has reduced habitat availabilities for species associated with those structures.

Hydrologic integrity of these subbasins is low to moderate. Most subbasins in Forest Cluster 3 have moderate aquatic integrity, but roading densities present an uncertain influence on watershed conditions. There are pockets of high integrity fish communities and relatively large numbers of strongholds, and most communities are still dominated by native species. Current conditions may indicate highly productive and resilient aquatic ecosystems; however, their association with low-integrity forest landscapes may indicate that cumulative effects of disturbance in streams may not have been expressed yet.

Forest Cluster 4

Subbasins in Forest Cluster 4 have relatively low forest integrity and low or moderate aquatic integrity. The highly altered forests are mostly comprised of the productive moist forest potential vegetation group. They tend to have the highest road densities in the project area, with few wildernesses or roadless areas.

Forest structures and composition have been altered. These forests generally show moderate to strong change in fire severity, but less change in fire frequency.

Terrestrial species vulnerable to human disturbance and/or exploitation have a relatively low amount of secure habitat presently available. Risks to species persistence have likely increased substantially for terrestrial vertebrates that rely heavily on early- or late-seral structures, and for species that prefer small openings. The overall decline of early-seral forest structures in moist forests has probably reduced habitat availabilities for moist forest species associated with those structures.

Hydrologic integrity of these sub-basins is moderate. Aquatic integrity is low or moderate. Although the aquatic systems often have some connectivity, the distribution of productive or strong watersheds is often fragmented.

Forest Cluster 5

Sub-basins in Forest Cluster 5 have low forest integrity and low or moderate aquatic integrity. Forest Cluster 5 is dominated by dry forests that are extensively roaded and have little, if any, wilderness.

Forest structure and composition have been substantially altered from historical conditions. These subbasins show large changes in fire frequency but less change in fire severity.

Relatively low amounts of secure isolated blocks of habitat persist for species vulnerable to human exploitation and/or disturbance. The substantial increase of late-seral forest structures has likely benefitted species preferring more densely stocked forests with a greater composition of shade-tolerant conifers; these same changes have likely reduced the habitat available for species preferring more open, park-like structures.

Hydrologic integrity of these sub-basins is low to moderate. Productive watersheds are often patchy in distribution. Native fish strongholds are poorly distributed, and the likelihood of widely distributed fish strongholds in the future is low.

Forest Cluster 6

Sub-basins in Forest Cluster 6 are in relatively poor condition from both a forest and an aquatic perspective, with especially fragmented aquatic systems. Forests in this cluster are comprised of a variety of dry, moist, and cold

forest potential vegetation groups. Subbasins are heavily roaded with little, if any, wilderness or roadless areas.

Forests are similar in composition and condition to those in Forest Cluster 5, but in Forest Cluster 6 there are more subbasins with moderate and high forest integrity. There is also a greater mix of dry and moist forests, and the change in fire frequency is not as dramatic.

Terrestrial wildlife species vulnerable to human disturbance and/or exploitation have a relatively low amount of secure habitat presently available. The risks to species persistence have likely increased for terrestrial vertebrates that rely heavily on early- or late-seral forest structures, and for species that prefer small openings. The overall decline of early-seral forest structures has probably reduced habitat availability for forest species that are associated with these structures.

Hydrologic integrity is the lowest of any Forest Clusters. Aquatic systems are especially fragmented, with few, widely scattered native fish strongholds, and the poorest overall conditions for fish communities. For the most part, remaining native fishes exist in remnant and isolated populations scattered throughout the subbasins. Many of the watersheds have been heavily influenced by non-native fish species. Some watersheds do support remnant strongholds and isolated populations of listed or sensitive fish species, or narrow endemic species.

Table 2-20 summarizes conditions in the six forest clusters.

Range Clusters

Selected subbasins that historically had at least 20 percent of their area comprised of dry grass, dry or cool shrub, and woodland potential vegetation groups were classified as range clusters. Relationships among variables reflecting vegetative conditions, hydrologic sensitivity, and human-caused disturbance were also used in a similar, but not identical, way as forest clusters. Range Cluster analysis identified dominant patterns and differences between subsets of these variables. What emerged were six range clusters, where sub-basins within clusters were more like each other than subbasins in other clusters.

Differences among clusters were summarized in terms of range conditions, departures in terrestrial communities, implications for rangeland vertebrate species, aquatic community status, and opportunities for management. Abbreviated range cluster descriptions follow.

Range Cluster 1 ~ Juniper Woodlands

Rangeland and aquatic integrity are low to moderate in Range Cluster 1, which is distinguished by having large areas of western juniper woodland. These subbasins support the highest average road densities. Very little is managed as wilderness or roadless, and over half the area is managed in range allotments.

There has been a substantial reduction in areal extent of herblands and shrublands, and large increases in woodland area. The average area in cropland and pasture is low. Fire frequency has declined in at least half of the subbasins, while fire severity has increased in 20 to 50 percent of the area.

Decline of herbland and shrubland types within this cluster suggests that persistence of terrestrial vertebrates such as the western sage grouse, pygmy rabbit, Brewer's sparrow, and loggerhead shrike is currently at risk. Conversely, increases in western juniper woodlands suggest that species such as the plain titmouse and the Townsend's solitaire would be favored.

Hydrologic integrity of these sub-basins ranges from low to moderate, and the riparian environment integrity commonly is low. A few areas support above average numbers of fish species or important salmonid stocks and habitats that could be connected to larger functional networks, but overall aquatic integrity is low to moderate, with watersheds in Categories 2 or 3.

Range Cluster 2 ~ High Integrity Dry Forest Ranges

Rangeland and aquatic integrity are high in Range Cluster 2. There are large blocks of wilderness and minimally roaded areas. These dry, forested ranges are generally in the lower elevations and have little area managed as range allotments.

Table 2-20. Summary of Forest Clusters (all lands).

Variable	Forest Cluster 1	2	3	4	5	6
	percent					
BLM/FS-administered	80	86	40	58	50	35
Forested Lands	83	81	70	88	53	48
Potential Vegetation Groups						
Dry Forest	16	37	35	18	81	51
Moist Forest	27	27	52	73	11	21
Cold Forest						
Road Density Classes	57	36	13	9	8	28
Low or none	85	62	32	20	22	36
Moderate or higher	15	38	68	80	78	64
Fire frequency change	37	60	66	51	60	60
Fire severity increase	36	50	57	47	35	36
High wildland/urban fire interface risk	0	17	6	1	29	10
Moderate wildland/urban fire interface risk	29	61	36	13	30	23
Forest Integrity						
Low	0	10	67	86	79	59
Moderate	0	43	33	10	21	17
High	100	47	0	4	0	24
Aquatic Integrity						
Low	5	0	8	54	52	87
Moderate	38	59	85	46	44	13
High	58	41	7	0	4	0
Hydrologic Integrity						
Low	0	4	47	12	39	76
Moderate	4	30	49	54	41	17
High	96	66	4	34	20	7
Composite Ecological Integrity						
Low	0	0	4	83	96	100
Moderate	0	3	96	17	4	0
High	100	97	0	0	0	0

Source: ICBEMP GIS data (converted to 1 km² raster data).

Herblands, shrublands, and woodlands (mixed conifer and juniper) declined significantly in this cluster. In some areas conifers have invaded historical meadows, grasslands, shrublands, and savannah woodlands, creating high fire fuel conditions.

The decline of shrubland and herbland community types suggests that wildlife species relying on the boundaries between shrubland or herbland habitats and dry forests would be most affected by the vegetation changes in this cluster. The progression of mixed-conifer woodlands to dry forest types would affect species that prefer habitats comprised of sparse trees.

Hydrologic and riparian integrity of these subbasins are high. Measures of fish community integrity and numbers of fish strongholds are among the highest in the project area, with most watersheds in Category 1 and most subbasins having two or more sensitive fish species. Connectivity of subwatersheds that function as native fish strongholds is good. Fish populations and communities associated with these subbasins are among the most resilient in the project area

and represent core distributions for many of the sensitive salmonids.

Range Cluster 3 ~ Moderate Integrity Dry Forest Ranges

Dry, forested ranges in Range Cluster 3 have moderate rangeland integrity and mixed aquatic integrity. These subbasins contain little or no wildernesses or roadless areas. Less than half of the subbasins are managed as public land range allotments.

These subbasins are among the most altered forested rangelands of the project area. Dry forest areas have experienced changes in structure and composition. Meadows, grasslands, shrublands, and savannah woodlands have been invaded by conifers, creating elevated fuel conditions for fires. Some areas are improving, but are still challenged by expansion of introduced exotic grasses and herbs. Average sub-basin cropland area is low to moderate.

Terrestrial wildlife changes are estimated to be similar to Range Cluster 2.

Hydrologic and riparian environment integrity of sub-basins within this cluster is low. For the most part, fish populations are fragmented and represented by remnant and isolated populations scattered throughout the subbasins. Some subwatersheds support remnant native fish strongholds, isolated populations of listed or sensitive species, or narrowly endemic species. Many areas are influenced by non-native fish species. Subbasins that straddle the Columbia River at the base of the Cascade Mountains represent the migration corridor for all anadromous fishes entering the Columbia River Basin, and contain the highest number of sensitive species in the project area. Other areas have low to moderate watershed integrity and contain important populations of key salmonids.

Range Cluster 4 ~ Columbia Shrub Steppe/Croplands

Range Cluster 4 is composed of 33 percent rangelands and 56 percent croplands. The landscape pattern is islands of native habitat surrounded by agricultural lands. The BLM and Forest Service manage only five percent of this cluster.

Subbasins in Range Cluster 4 have the lowest rangeland and aquatic integrity of all rangelands in the project area. One wilderness lies within this cluster. Range allotments on public lands are minimal. Subbasins in this cluster are distinguished from other clusters by being comprised primarily of cropland and pasture.

Herblands and shrublands decreased significantly in these subbasins. Of the grassland and shrubland areas that have not been converted to cropland or pasture, most have been overgrazed and invaded by exotic grass and forbs.

Conversion of native herblands and shrublands to agricultural types has diminished habitat for a large number of wildlife species. Species associated with mixed-conifer woodlands have likely increased as a whole across the cluster.

Hydrologic and riparian integrity of these sub-basins is low. Some subbasins in Range Cluster 4 contain major stretches of the mainstem Columbia and Snake Rivers, and contain the highest values for numbers of fish species in the cluster. Other aquatic systems have been radically altered, and most native fishes in the subbasin currently exist as very isolated populations, with some scattered salmonid strongholds.

Range Cluster 5 ~ Moderate Integrity Upland Shrublands

Subbasins in Range Cluster 5 are comprised of upland shrublands with moderate integrity and mixed aquatic integrity. These subbasins represent the bulk of the high elevation ranges. They are less developed, less roaded, more remote, and tend to be less disturbed by agricultural conversion or grazing than cropland-dominated subbasins.

Large areas are in the cool shrubland potential vegetation group, with the lowest area in cropland of the range clusters. Herbland habitats have decreased significantly.

Declines in herbland and shrubland habitats in this cluster have contributed to observed declines in populations of several species of upland game birds, songbirds, raptors, ungulates, and small mammals. An increased area in exotic grasses and herbs and croplands has likely benefitted some non-native vertebrates.

Hydrologic and riparian integrity of these subbasins is high and moderate, respectively. Among rangeland clusters, these subbasins support the highest diversity of salmonids and a relatively higher proportion of population strongholds. Introduced species have played an important role, but overall aquatic integrity remains moderate in some places, and good to excellent in others. Several subbasins still have relatively high quality river corridors designated under the National Wild and Scenic Rivers Act. Moderate or better water quality suggests that the potential for connection among some subwatersheds is still good.

Range Cluster 6 ~ Low Integrity Upland Shrublands

Both rangeland and aquatic integrity in these sub-basins are low. The dry shrubland potential vegetation group dominates upland shrublands. Road densities are relatively high. Most rangelands on public lands in this cluster are managed as range allotments.

Subbasins in this cluster are highly altered and have been invaded by exotic species, or converted to crested wheatgrass and other desirable exotic grasses. Herblands and shrublands decreased significantly. The amount of croplands varies.

Declines in herbland and shrubland habitats have contributed to declines in populations of several wildlife species. The overall increase of mixed-conifer woodland area across the cluster has likely increased habitats for other species.

Hydrologic integrity of these sub-basins ranges from low to moderate, and riparian integrity is commonly low. Subbasins in this cluster represent some of the most strongly altered aquatic systems in the project area. Aquatic communities vary greatly, with a few salmonid strongholds, but with overall highly fragmented habitat and isolated fish populations. Introduced warm water fishes have influenced many lakes, and recreational fisheries throughout much of the area currently focus on introduced races.

Table 2-21 summarizes conditions in the six range clusters.

Composite Ecological Integrity

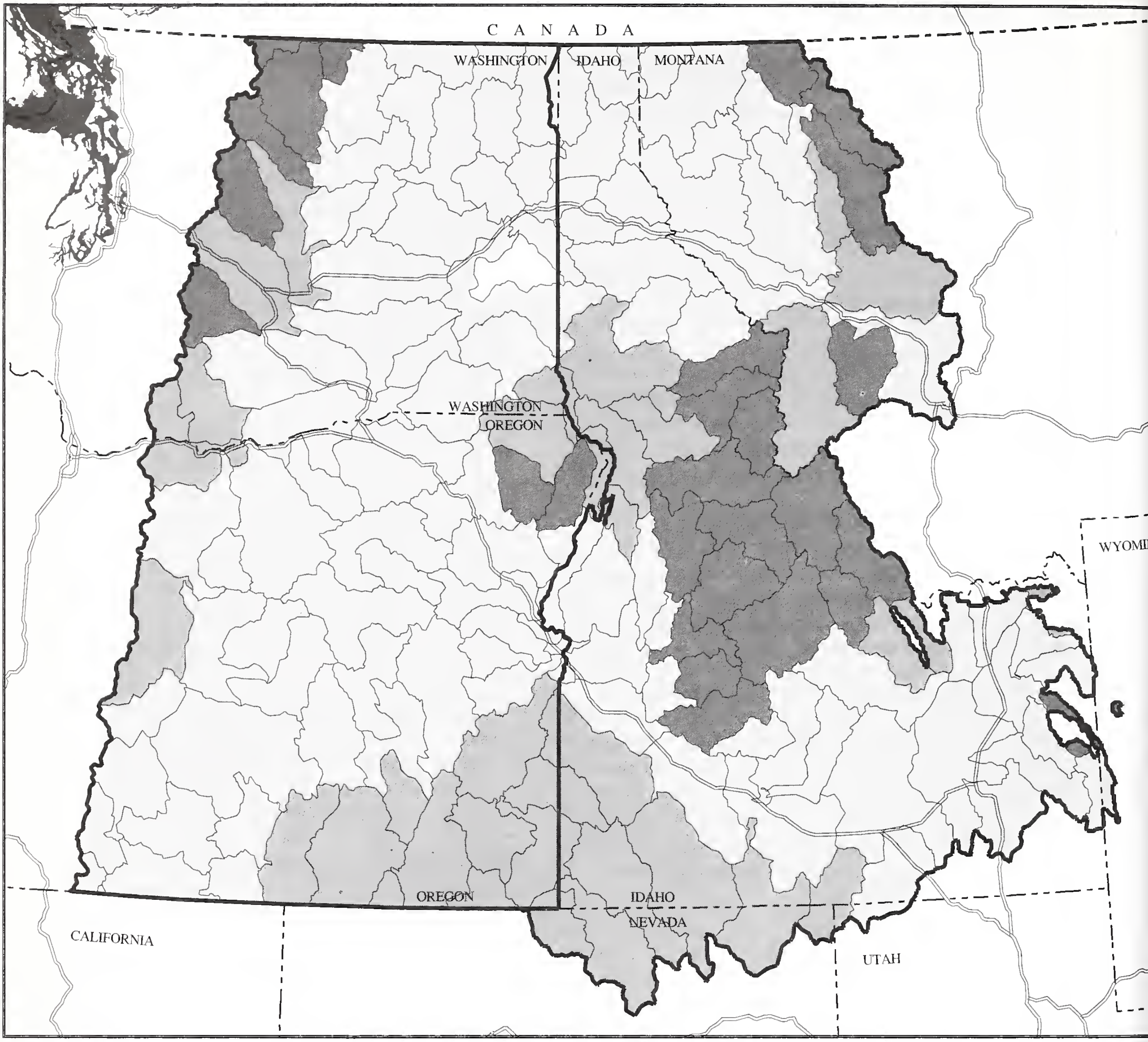
The SIT recognized that there are no direct measures of ecological integrity and that assessing integrity requires comparisons against a set of ecological conditions and against a set of clearly stated management goals and objectives as described in the alternatives. The SIT also recognized that this process is not a strictly scientific endeavor (Wickium and Davis 1995), because to provide meaning, ecological integrity must be grounded in desired outcomes. The initial estimates were based on current understanding and information, and are not presumed to be absolute.

Current ecological integrity was based on the analysis of the 164 subbasins within the project area. Relative integrity ratings (high, moderate, low) were assigned by subbasin for forestlands, rangelands, forestland and rangeland hydrology, and aquatic systems. The analysis was based on information from the *Scientific Assessment* (Quigley and Arbelbide 1996 and Quigley, Graham, and Haynes 1996) and understandings of conditions and trends. At present, 26 percent of the BLM- or Forest Service- administered lands is in high, 28 percent is in moderate, and 46 percent is in low ecological integrity. Map 2-34 displays this information.

Table 2-21. Summary of Range Clusters (all lands).

Variable	Range Cluster 1	2	3	4	5	6
			percent			
BLM/FS-administered	36	81	44	5	75	55
Rangelands	54	5	6	29	65	59
Rangeland Vegetation Groups						
Dry Rangeland	49	34	17	30	61	61
Cool Rangeland	34	8	8	3	27	11
Other	17	58	75	67	12	28
Road Density Classes						
Low or none	20	71	30	62	64	30
Moderate or higher	80	29	70	38	36	70
Cropland/pasture	9	3	14	56	5	17
<12" annual precipitation	23	1	2	51	33	38
Fire frequency change	37	51	67	17	24	17
Fire severity increase	18	47	49	13	16	9
High wildland/urban fire risk interface	32	7	12	0	6	8
Moderate wildland/urban fire risk interface	10	59	33	4	58	39
Change in juniper woodland	+ 12	0	0	0	0	0
Range Integrity						
Low	100	6	76	100	26	79
Moderate	0	37	15	0	50	21
High	0	57	9	0	24	0
Aquatic Integrity						
Low	39	4	43	84	37	79
Moderate	61	24	50	16	57	18
High	0	72	7	0	6	3
Hydrologic Integrity						
Low	34	6	49	100	7	44
Moderate	66	16	35	0	35	34
High	0	78	16	0	58	22
Composite Ecological Integrity						
Low	100	0	58	97	8	80
Moderate	0	3	32	3	63	20
High	0	97	10	0	29	0

Source: ICBEMP GIS data (converted to 1 km^2 raster data).



50 0 50 100 150 miles

50 0 50 100 150 km

N

Map 2-34. Composite Ecological Integrity

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996

High
Moderate
Low
No BLM/FS Lands Present in HUC
4th HUC Boundaries
Major Roads

UCRB Chapter 3

Alternatives

Contents

Key Terms

Adaptive management ~ A type of natural resource management that implies making decisions as part of an on-going process. Adaptive management involves testing, monitoring, evaluation, and incorporating new knowledge into management approaches based on scientific findings and the needs of society.

Disturbance ~ Any event that alters the structure, composition, or function of terrestrial or aquatic habitats; fire, flood, and timber harvest are examples of large-scale disturbances.

Desired Range of Future Conditions (DRFC) ~ A portrayal of the land, resource, or social and economic conditions that are expected to result in 50–100 years if objectives are achieved; in this document, portrayed as a range of conditions. A vision of the long-term condition of the land.

Ecological integrity ~ In general, refers to the degree to which the elements of biodiversity and the functions and processes that link them together and sustain the entire system; the quality of being complete; a sense of wholeness.

Ecological process ~ The flow and cycling of energy, materials, and organisms in an ecosystem.

Endemic species ~ Plants or animals that occur naturally in a certain region and whose distribution is relatively limited to a particular locality.

Lethal (stand-replacing) fires ~ In forests, fires in which less than 20 percent of the basal area or less than 10 percent of the canopy cover remains; in rangelands, fires in which most of the shrub overstory or encroaching trees are killed.

Maintain ~ To continue to keep ecosystem functions, processes, and/or components (such as soil, air, water, vegetation) in such a condition that the ecosystem's ability to accomplish current and future management objectives is not weakened. Management activities may be compatible with ecosystem maintenance if actions are desinged to maintain or improve current ecosystem conditions.

Mature and old multi-story forest ~ Forest characterized by two or more canopy layers with generally mature and old trees in the upper canopy. Understory trees are also usually present. It can include both shade-tolerant and shade-intolerant species, and is generally adapted to a mixed fire regime of both lethal and non-lethal fires.

Mature and old single-story forest ~ Forest characterized by a single canopy layer consisting of mature and old trees. Understory trees are often absent, or present in randomly spaced patches. It generally consists of widely spaced, shade-intolerant species, such as ponderosa pine and western larch, adapted to a non-lethal, high frequency fire regime.

Mature ~ Refers to ages and sizes of dominant trees that are at least at culmination of mean annual increment of tree stand volume growth.

Nonlethal fire ~ In forests, fires in which more than 70 percent of the basal area or more than 90 percent of the canopy cover survives; in rangelands, fires in which more than 90 percent of the vegetative cover survives (implies that fire is occurring in an herbaceous-dominated community).

Old ~ Refers to ages and sizes of dominant trees that are significantly beyond what may be found at culmination of mean annual increment of tree stand volume growth.

Proper Functioning Condition (PFC) ~ Riparian-wetland areas achieve Proper Functioning Condition when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high water flows. This thereby reduces erosion and improves water quality; filters sediment, captures bedload, and aids floodplain development; improves floodwater retention and groundwater recharge; develops root masses that stabilize stream banks against cutting action; develops diverse ponding and channel characteristics to provide habitat and water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses; and supports greater biodiversity. The functioning condition of riparian-wetland areas is a result of the interaction among geology, soil, water, and vegetation.

Introduction

Chapter 1 explained the purpose of, and need for, the action proposed by this project. It also briefly described the scoping process that identified the significant issues addressed by this EIS. Chapter 2 described resource conditions and trends. Chapter 3 presents a range of alternative management strategies, developed in response to the information presented in Chapters 1 and 2.

Chapter 3 includes seven alternatives presented in detail. Alternatives 1 and 2 are each variations of a "no-action" alternative, while Alternatives 3 through 7 are "action" alternatives. The term "No Action" does not mean no management; rather it is a term used in the National Environmental Policy Act (NEPA) to signify an alternative that is a continuation of current management, and no different action is required.

Each action alternative was formulated through a multi-step process. For help in understanding these alternatives, please see "A User's Guide to the Action Alternatives" found at the end of this chapter.

Alternatives Considered But Eliminated From Detailed Study

During the extensive public involvement process that started with the publication of the Notice of Intent to prepare this EIS, several public groups, tribes, and other governmental agencies participated by offering written suggestions for formulation of alternatives or for parts of an alternative. Those offering suggestions included several American Indian tribes, Boise Cascade Corporation, the Eastside Ecosystem Coalition of Counties, Weyerhauser Corporation, the World Wildlife Fund, and Federal agencies including the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, and the U.S. Environmental Protection Agency.

Input submitted by several American Indian tribes included proposals on aquatic conservation strategies, socio-economic considerations, and other information relating to trust responsibilities. This input was considered and used during alternative development.

An aquatic conservation strategy was proposed based in part on input from the Association of Forest Service Employees for Environmental Ethics (AFSEEE) and the Columbia River Inter-Tribal Fish Commission (CRITFC). Much of this strategy has been incorporated into Alternative 7. Additional interactions with the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, and the Environmental Protection Agency led to modification of aquatic strategies for other alternatives.

Suggestions were reviewed by the interdisciplinary teams in light of the purpose and need statement, the issues identified through the public scoping process, the level of detail at which this EIS is being written, the information available in the assessment from the Science Integration Team, and the themes of the alternatives. To the extent the suggestions helped meet the purpose and need and address identified issues at the broad scale of this EIS, they were used in development of the "action" alternatives.

Only one complete alternative from outside the government was presented for the EIS teams' consideration. This came from the Association of Forest Service Employees for Environmental Ethics (AFSEEE). The EIS teams determined that, taken in its entirety, the AFSEEE alternative did not fully address the purpose of, and need for, action. Specifically, it did not meet the need to support the economic and/or social needs of people, cultures and communities, and to support predictable and sustainable levels of goods and services from National Forest System- and BLM-administered lands. Further, the proposed alternative was not based on the Science Integration Team's assessment. Although the AFSEEE alternative was not described in its entirety as a separate alternative, and not analyzed in detail, several of its elements were incorporated into Alternative 7.

Development of Alternatives Considered in Detail

Alternative development began with the purpose of and need for the proposed action described in Chapter 1. Briefly, the purpose is to provide a coordinated approach to a scientifically sound, ecosystem-based management strategy for lands administered by the Forest Service or BLM in the

project area. The needs are to restore and maintain long-term ecosystem health and integrity including support of the economic and/ or social needs of people, cultures and communities, including support of predictable and sustainable levels of goods and services from National Forest- and BLM-administered lands.

The action alternatives (3–7) are all intended to meet this purpose and fulfill this need. The no-action alternatives (1 and 2) were not designed to fully satisfy the purpose and need, but to provide the NEPA-required benchmarks against which to evaluate the action alternatives.

Alternative 1 would continue management specified under the existing regional guides and forest plans for Forest Service- administered lands, and resource management plans and management framework plans for BLM-administered lands. The EIS team did not attempt to include a description of all of these current plans in Alternative 1, because they are written at a more detailed scale than is appropriate for this project. Instead, a group of experienced planners from both agencies was formed to review existing plans. This work group then consolidated objectives, standards, and guidelines from those plans into objectives, standards, and guidelines that are representative of existing plans at the broad scale. The work group, in collaboration with the EIS team, then described the "desired range of future conditions" that was expected to result from the existing plans if they are successfully implemented. Many of the objectives and standards listed in Alternative 1 appear in most of the existing plans. However, the description of Alternative 1 does not include all of the decisions of any one current plan, and not all of the objectives and standards of Alternative 1 appear in any one land-use plan in the study area.

Alternative 2 includes the direction of Alternative 1, and, in addition, would adopt recent interim aquatic conservation strategies (PACFISH and INFISH) as the direction for the long term. The desired range of future conditions for Alternative 2 is the same as that for Alternative 1, with the addition of a description of expected or desired water quality, aquatic, and riparian conditions to reflect long-term application of interim strategies.

The action alternatives were developed to respond in different ways to the seven issues identified through the scoping process (as described in Chapter 1), as well as the resource conditions and trends identified by the Science Integration Team (SIT), which are summarized in Chapter 2. The themes of the alternatives were developed to provide a range of reasonable alternative responses to identified issues. For example, issue number 2, shown in Chapter 1, is, "To what degree, and under what circumstances, should restoration be active (with human intervention) or passive (letting nature take its course)?" The theme of Alternative 4 is to aggressively restore ecosystem health through active management. The theme of Alternative 7 is to establish a system of reserves on public land in which the level of human use and management is very low. The other alternatives portray levels of human intervention that lie between these two sideboards of active versus passive management.

Mitigation

The alternatives include goals and objectives, and their achievement may require alteration of the physical and biological environment. However, the record of decision does not itself fund, authorize, or carry out any ground-disturbing activities.

The alternatives also include standards and guidelines (related to other goals and objectives) that will minimize the environmental consequences associated with modifying the landscape. Because they are mandatory, standards will prevent certain future actions, or parts of them, from occurring (40 CFR 1508.20(a)). Standards will also minimize environmental impacts by limiting the level of future activities (40 CFR 1508.20(b)). In addition, each alternative includes a component of restoration (40 CFR 1508.20(c)). Thus, mitigation is an integral component of each of the alternatives.

Further site-specific mitigation measures will be adopted in conjunction with projects implementing this decision. Such decisions will be preceded by additional environmental analysis, at which time additional concerns regarding mitigation will be addressed.

What Is Restoration?

Restoration is a term and concept used as a basis for several of the action alternatives. It means to restore the functions and/or processes associated with certain ecosystem components. In a general sense, it relates to achieving and/or maintaining more sustainable conditions over time. Alternatives 4, 6, and 7 heavily emphasize restoration to achieve more sustainable ecosystem function, structure, and process. A combination of active and passive actions are anticipated to achieve the goals and objectives of these alternatives. Restoration can take on many forms, and some of these are briefly discussed below.

Active Restoration ~ Investments of time, money and human resources are generally necessary for active restoration. As described in Table 3-12 and in other parts of this Draft EIS, active restoration can include a variety of activities.

Livestock management includes improved grazing systems, changing riparian management grazing practices, season of use, herding, number of animals, distribution, and kind of animals. Restoration of rangeland resources can be influenced by improved combinations of livestock management techniques.

Improving rangelands includes investments in fencing, stock water improvements, seedings, control of exotic weeds, and control of shrubs and juniper expansion. Active control of exotic weeds can benefit wildlife through improved habitat and soil and hydrologic functions, which can result in more natural or favorable fire regimes.

Watershed restoration and riparian restoration includes improved road maintenance, plantings, instream channel improvements and riparian exclosures. Closed roads closed that still have a negative effect in the watershed can be obliterated and put back to the original slope.

Decreasing the negative impacts of roads includes decreasing road density through obliteration or permanent closures of primarily native surfaced roads, improving location and drainage, improving stability, reducing sediment, and more effective maintenance.

Prescribed fire includes the ignition of fire under controlled conditions to reduce fuels or alter species composition, structure, or stocking.

Prescribed natural fire is generally guided by approved fire management plans and is intended to reintroduce fire into ecosystems to achieve multiple benefits.

Timber harvest can be used to alter stocking, species composition and distribution, structure, seral stage, habitat condition, and favor large trees that are more resistant to fire, insects and disease. Patterns can be created that are more sustainable and resilient to catastrophic disturbances.

Thinning can be used to effectively reduce stocking levels and associated stresses, and alter species composition to more desirable mixes.

Other active measures, such as reduction in stand density, fuels, and patterns of vegetation can help reduce risks in urban/rural/wildland interface lands, thus helping to sustain desirable wildland conditions.

Active restoration also includes such activities as altering recreation sites to improve streambank and sedimentation conditions. Managing vegetation patterns across the landscape can restore more sustainable mixes of successional stages in both rangelands and forestlands. These patterns can then contribute to better functioning connective corridors to improve genetic interactions of species. Investments are often needed to re-connect fragmented aquatic habitats that impede movement and interactions of species. Reduction of fuels in wildland/urban interface areas can protect other resources and improvements over time.

It can be expected that some activities will be designed and implemented to meet several objectives, including both social/economic and ecological restoration objectives. Some watersheds, for example, currently contain road systems which are negatively impacting aquatic species. These same watersheds may also have existing vegetation conditions which are undesireable. Carefully designed activities could address both the undesireable vegetation and road/watershed conditions in ways that improve the ecosystem over time, and also provide employment opportunities.

Passive Restoration ~ Restoration of riparian function is often achieved by passive protective actions which allow vegetation, sediment flow and channel development to occur naturally. Aquatic conservation strategies establish priorities and protection for riparian areas and restrict activities that could degrade these values. Through this combination of restricting certain management activities, and allowing natural processes to work, riparian restoration can be successful.

What is Restoration? (continued)

In conjunction with active measures such as road closures, other objectives can often be achieved passively. For example, maintaining or restoring fisheries and wildlife habitats, reducing pressure on isolated populations, or retaining large dead or downed trees can occur naturally in some areas by reducing or restricting human access. Seasonal road closures can also benefit wildlife species or reduce the risk of human-induced wildfires.

Often policy decisions or direction can help restore ecosystem function or condition without requiring additional direct expenditures. Retention of connective corridors, snags, or large shade intolerant trees such as ponderosa pine, are done more by design than by investments. Strategies used to suppress wildfire often have long-term results affecting pattern and structure on the landscape. Restoration of favorable fire regimes can be achieved in part by how current fire policies are applied or altered.

Spatial Considerations ~ The forest and range clusters generally describe opportunities and priorities for restoration. These are augmented by activity tables indicating expected activity levels by cluster and by alternative. Between Draft and Final EIS, the Project staff intend to develop more spatially specific information and prioritization for restoration and other activities, while addressing inherent risks.

Restoration Success ~ Restoration activities are expected to vary by alternative and local conditions. The success of restoration activities needs to be closely monitored to assure desired results occur. Through adaptive management, land managers can learn which actions are most successful locally, and can constantly adjust practices to achieve desired restoration results.

Description of the Alternatives

Each of the seven alternatives is considered in detail and described below. For each alternative, a theme, or brief description of the alternative, is presented, followed by a discussion of the design or focus of the alternative. A description of the desired range of future conditions anticipated under the alternative is then given. Following this general description of each of the alternatives, the objectives and standards for each alternative are presented.

Management Emphases

One of six management emphases was given to each forest and range cluster (see last section in Chapter 2 for definition). The emphases are conserve, restore, produce, conserve-restore, conserve-produce, and restore-produce. The primary three emphases are defined below. See the User's Guide at the end of this chapter for more information.

Conserve ~ Management emphasis is on protection and maintenance of forest, rangeland, and aquatic conditions, health, and integrity. Management recognizes that natural processes dominate the landscape and gradual change will occur. Generally, the conserve emphasis is applied as the primary management emphasis to areas with moderate to high ecological integrity. Secondarily, the restore or produce emphasis is applied when associated benefits can be provided.

Restore ~ Management emphasis is designed to move ecosystems to desired conditions and processes, and/or to healthy forestlands, rangelands, and aquatic systems. A variety of management-induced activities dominate the landscape. Generally, restore emphasis is applied to areas of moderate to low ecological integrity. Secondarily, the conserve emphasis is applied to areas with high integrity, and the produce emphasis is used when associated benefits can be provided.

Produce ~ Management emphasis is directed at providing, growing, or making goods and services available for human needs and/or desires, while sustaining productivity and maintaining associated values. Under produce emphasis, consumption-based activities dominate the landscape. This management emphasis is applied to areas available and suitable for resource production in order to provide goods and services. A restore emphasis may be used secondarily when production can be benefited.

What is meant by the term "Conserve"?

The term "conserve" is used to describe management emphasis for different sub-basins, and varies by alternative. In the broadest sense, it means to protect from loss or depletion. As applied in this document, the term implies the recognition of ecosystem functions and processes that are socially desirable and ecologically sustainable, and management of land, resources, and human interactions such that these are perpetuated in the future. Management emphasis of conserve can be attained both passively and actively, and can take on many forms.

Active Conservation ~ Investments of time, money and human resources are generally necessary for active conservation. Management actions are generally preceded by some form of analysis aimed at understanding what functions and processes are occurring that make the situation desirable. Analysis should also address the risks and opportunities of perpetuating these desired conditions into the future. Some examples include:

- maintenance of roads and trails to prevent erosion or sedimentation that could adversely affect water quality;
- removal of culverts that obstruct the natural meandering of a stream;
- managing vegetation to perpetuate desirable structure for rare species;
- closing of new roads after project completion to maintain habitat for species requiring seclusion;
- periodically using prescribed fire to maintain parklike conditions; and
- adapting a grazing strategy to insure the maintenance of proper functioning condition.

Passive Conservation ~ This is usually achieved by conscious decisions to allow natural events to maintain existing conditions, or move conditions to a desired status over time. Risks vary substantially depending on vegetation types, natural disturbance regimes and introduced factors such as exotic plants. Passive conservation still requires monitoring to assure desired results occur over time. Some examples of passive conservation include:

- management of research natural areas;
- administrative protection of special areas where management activities and/or human access is limited;
- policies or programs that retain desirable elements in the landscape, such as policies to not allow large trees to be harvested for fuelwood; and
- allowing natural disturbance to occur, such as prescribed natural fire in wilderness.

In reality, under a conserve management emphasis, there are generally a combination of active and passive approaches. Managing a Wild and Scenic River corridor often includes the exclusion of some practices that are acceptable in other places (passive), but management of human activities such as rafting (active) so that overall, desirable outcomes are perpetuated over time. The conserve management emphasis recognizes that ecosystems and human values are dynamic and will continue to change over time. Coupled with this, however, is the need to maintain options for the future or to perpetuate conditions or trends that are socially acceptable and ecologically sustainable.

Objectives are intended to move conditions toward the desired ranges of future conditions described for alternatives and to be implemented within 10 years. Objectives will differ among alternative and clusters according to different emphasis or combinations of emphasis as described by using the words restore, conserve, or produce. Although these alternatives by clusters may have emphasis to restore or conserve or produce something, this does not indicate that there are no other major uses of resources. For example, production of forage for livestock grazing is still a major part of all alternatives even though there may not be an emphasis to produce livestock forage in an objective. It is expected that restoration, conservation, and production activities would occur in all alternative even if they are not emphasized in an objective.

Management emphasis was developed and given to each forest and range cluster to indicate expected priorities and outcomes from management activities. These are not allocations in the traditional land management planning sense. This emphasis was developed from the description of Management Priorities in Chapter 1, and given to the clusters by alternatives based on the themes of the alternatives and Desired Range of Future Conditions described later in this chapter. The intent was to indicate general priorities and outcomes to aid analysis of the effects of the alternatives. These management emphasis descriptions were not intended to be allocations of land areas or activities.

What Is meant by the term "Produce"?

The Produce management emphasis generally means that actions are aimed at providing, growing, or otherwise making available goods and services for human needs within the capabilities of ecosystems. This is primarily an active management approach where landscapes are assesed for their capabilities and that is matched as best possible to human demands. Goods and services from these lands generate wealth, and provide for the well-being of communities and individuals. Existing laws for environemental protection are met, as is direction in existing management plans. The produce managmenet emphasis also reflects the desired range of future conditions and is guided by standards and objectives in Table 3-5. Goods and services include a wide variety of benefits, ranging from timber products, livestock forage, and minerals, to harvestable populations of fish and wildlife, and developed recreation. Under this management emphasis, there are significant investments in money, time, and human resources to manage for conditions that will provide goods and services over time, while protecting resources and reducing impacts from wildfire, insects, and disease.

The management emphasis given to each cluster by alternative should be used during implementation to outline the framework and context to conduct management activities. Local decision processes are intended to reflect these priorities, emphasis, and opportunities. Management emphasis is one part of the process that links broad-level decisions and information to finer levels, and plays an important role in mid-level analysis, as described in appendix I.

Alternative 1

Theme

Alternative 1 (no action) continues management specified under existing Forest Service and BLM land-use plans. Implementation of this alternative would occur assuming recent budgets. Analysis of the alternative is a requirement of the National Environmental Policy Act (NEPA) and BLM and Forest Service planning procedures. This alternative displays the likely outcome of Federal agencies' use of existing plans to manage lands and resources into the future.

Existing Forest Service and BLM plans include regional guides, forest plans (for each National Forest), resource management plans, and management framework plans (for BLM Districts). The no-action alternative includes direction from 16 National Forest plans and 31 BLM plans prepared between 1975 and 1990.

Although substantial variation exists among agency plans, the general management approach is to emphasize or accommodate sustained timber, wood fiber, and livestock forage production in an environmentally prudent manner while managing and protecting other resources and values. Timber and livestock management are integrated and coordinated with the maintenance or enhancement of wildlife and fish habitat, scenic quality, recreation opportunities, and other resource values to achieve overall multiple-use goals and objectives. On many areas, management of other resources or values is emphasized such as recreation, Wilderness, big game and fish habitat, and cultural resources.

What is the Design of Alternative 1?

The underlying philosophy in Alternative 1 is one of multiple-use of the National Forests and BLM-administered lands, to produce goods and services in helping to meet the needs of the American people. Many current plans emphasize sustained yields of timber, wood fiber, and livestock forage, while maintaining site productivity and environmental quality. The EIS team has attempted to reformat the description of the decisions in current plans to allow comparison with Alternatives 3 through 7.

Activity tables (tables 3-6 and 3-7) are presented for each forest and range cluster by alternative to aid in analysis of effects and for projection of outcomes if Alternative 1 were selected.

Under Alternative 1, production is generally emphasized in both forest and range clusters (see table below, and maps 3-1 and 3-2). A relatively high level of outputs of timber and livestock forage is expected under many current plans in the project area.

With a general focus on production from forestlands, many current plans rely on even-

aged management practices leading to forests characterized by a regulated forest of early to mid-seral structures, early successional species, and controlled densities and patterns. Generally a minimum level of late/old structures and habitats is planned. Many forest plans were based on the assumption of healthy ecosystem conditions. On rangelands, vegetation management is focused on providing forage for livestock and wildlife while protecting productivity and coordinating with other uses.

A number of other resources and related activities, including recreation, Wild and Scenic Rivers, mining, wildlife, fisheries, and Wilderness are managed for their intrinsic values. Some resources, such as Wilderness, are managed to protect and maintain their intrinsic values. Although restoration activities occur in this alternative, most are planned at relatively low levels. Exceptions include stand density controls through thinning in forest clusters 3, 4, and 5 at moderate levels, and use of prescribed natural fire at high levels in forest clusters 1 and 2 and range cluster 2.

Within Alternative 1, wildlife habitat management generally results from the coordination of forest and range management activities. Many plans incorporate management of habitats and habitat components for big game and other game animals, which could be relatively easily coordinated with vegetation management. Emphasis is on developing effective habitat by managing factors of vegetative conditions and distribution of roads. Noted earlier, certain key habitats and habitat components such as late/old-growth forests, snags, and downed wood were generally planned to be at relatively low levels (often the minimum) with the intent of maintaining viable populations. The plans require protection of unique habitats and recovery of threatened and endangered species through the appropriate recovery process.

Planned management of riparian and aquatic resources is often focused on attainment of water quality and habitat criteria (pools, large wood, stable banks, vegetative conditions) through application of Best Management Practices (BMPs). BMPs are a system of accepted practices often focused on protection of key resources or prevention of an undesirable impact, while allowing for existing uses. Restoration of watershed and aquatic resources under Alternative 1 is encouraged.

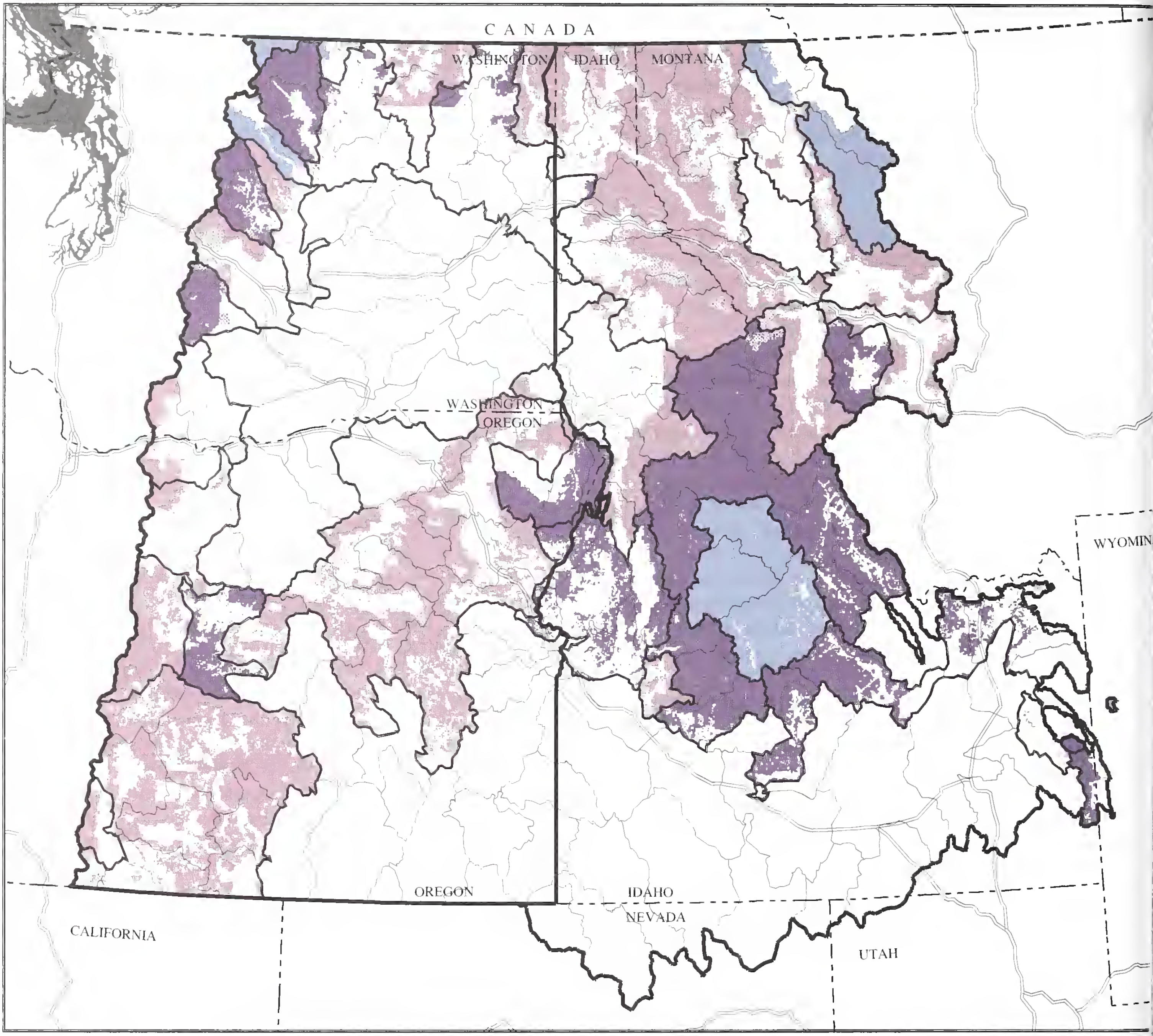
Map 3-3 shows areas where ecosystem analysis is required under Alternative 1.

Desired Range of Future Conditions

Alternative 1 is based on existing land and resource management plans currently being implemented by the BLM or the Forest Service. Within the upper Columbia River Basin EIS area, there are 47 existing plans for these lands. Each plan has desired future conditions or other expectations. The plans are from 6 to 21 years old and cover diverse ecosystems; therefore there are large differences in the desired future conditions described among the plans. This has been discussed in Chapter 1 and is one of the reasons for development of this environmental impact statement with more consistent management strategies. Recognizing the diverse expectations within existing plans, the following is intended to display general expectations so comparisons can be made between the existing plans and other alternatives. As disclosed in Chapter 4, there have been significant challenges in achieving the desired range of future conditions of the existing plans.

Alternative 1 - Management Emphasis Within Forest and Range Clusters for the Project Area

	Forest Cluster		Range Cluster	
	% of Forest Cluster	Cluster No.	% of Range Cluster	Cluster No.
Management Emphasis				
Conserve	10	1	8	2
Produce	57	3, 4, 5	67	1, 4, 5, 6
Produce/Conserve	33	2, 6	25	3

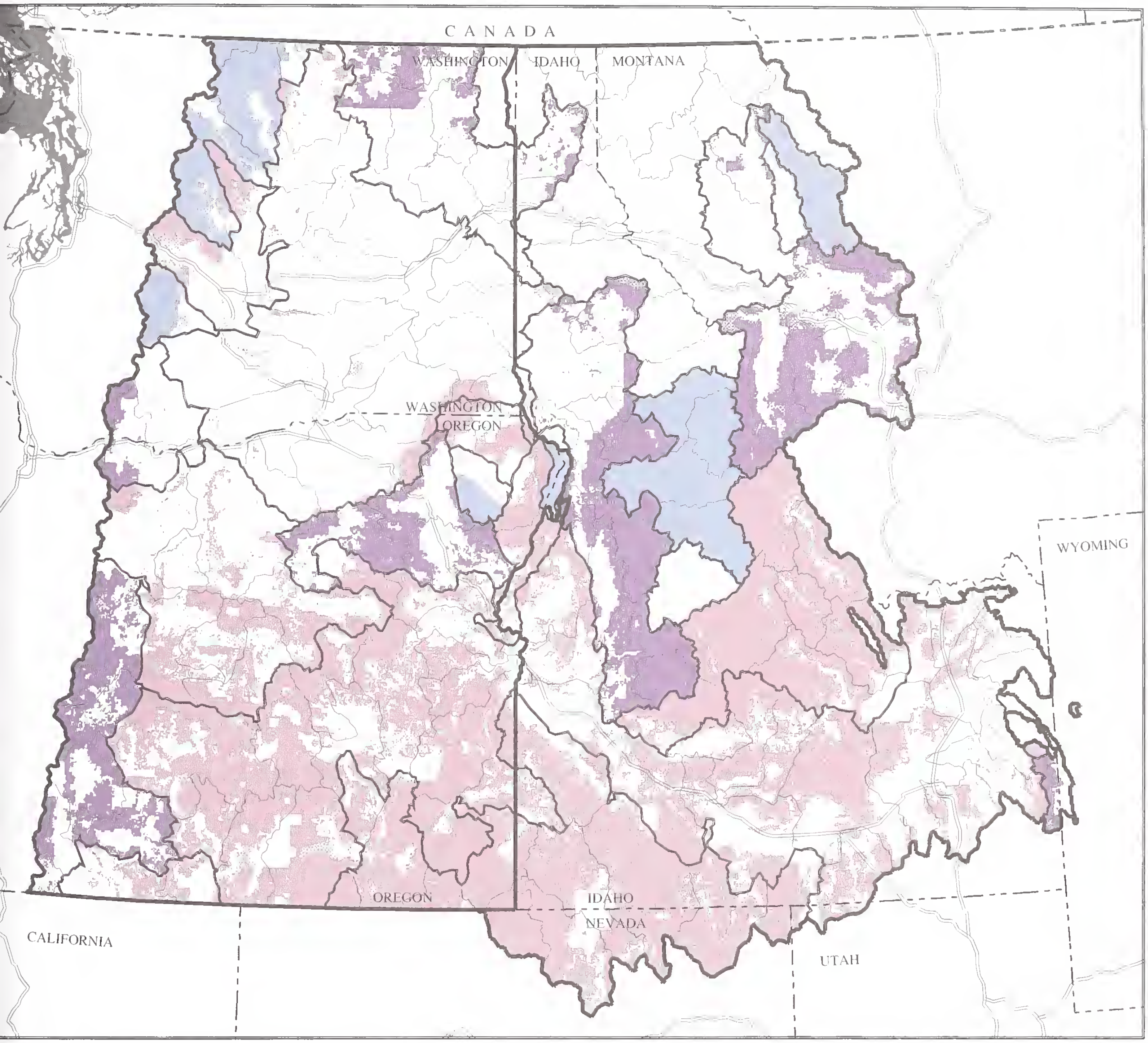


Map 3-1.
Alternative 1
Management Emphasis for Forest Clusters

BLM and Forest Service Administered Lands Only

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Project Area
1996

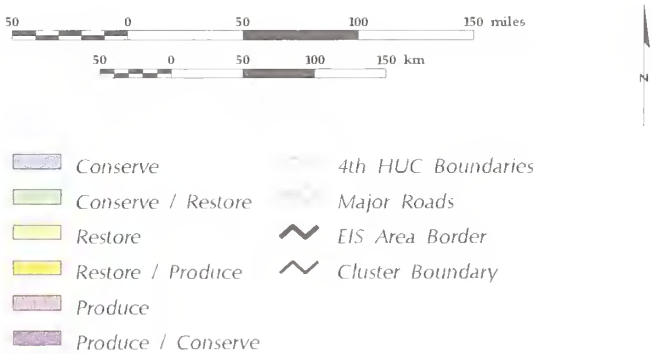


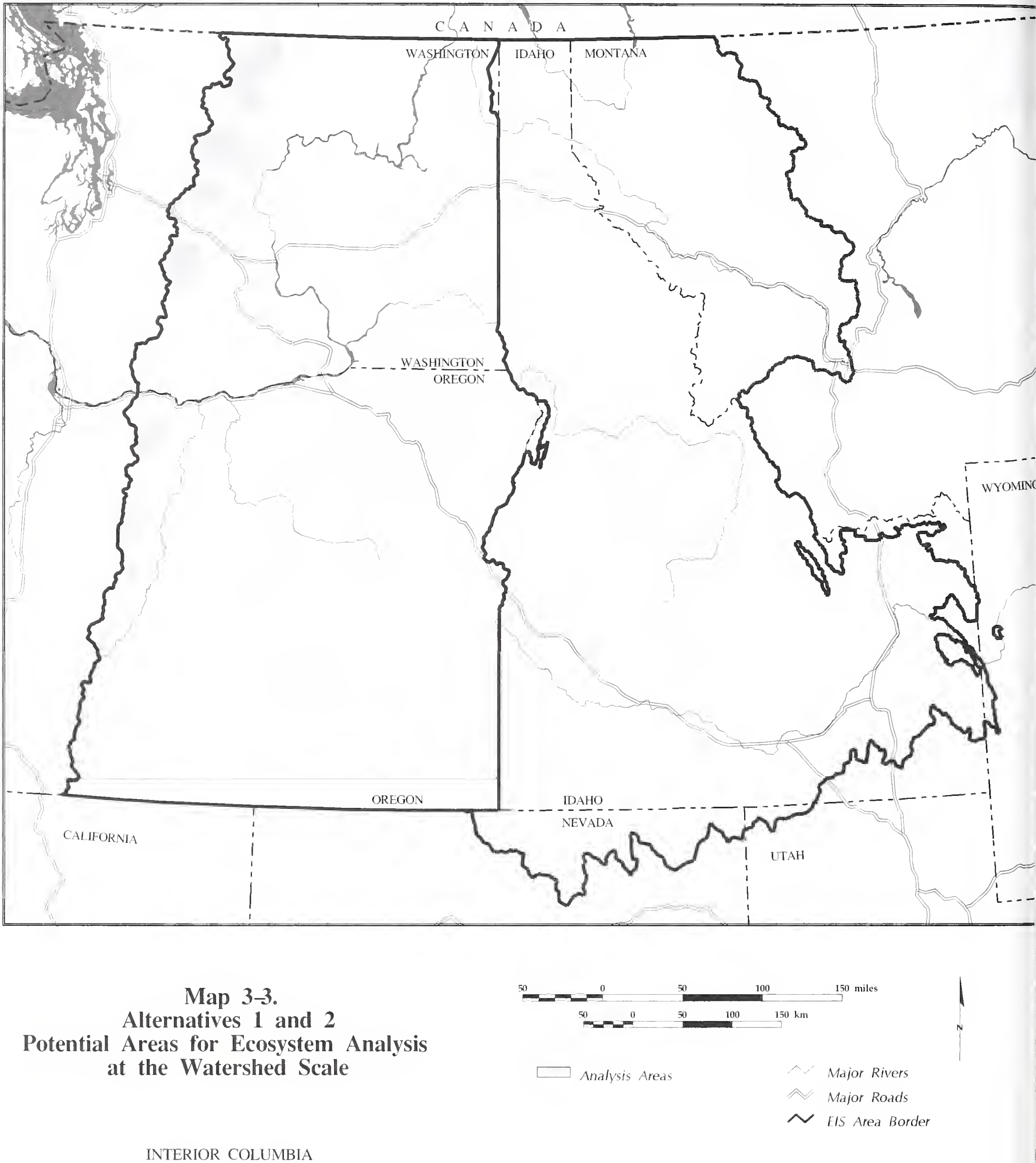
Map 3-2. Alternative 1 Management Emphasis for Range Clusters

BLM and Forest Service Administered Lands Only

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Project Area
1996





Map 3-3.
Alternatives 1 and 2
Potential Areas for Ecosystem Analysis at the Watershed Scale

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996

Resource Management

Forests, shrubs, and grasslands, managed by the BLM and Forest Service, continue to provide a mix of natural resource-based goods and services. Management focuses on providing resource outputs including timber, livestock forage, huntable wildlife, and minerals while also providing for other multiple-uses and values including aesthetics, recreational opportunities, wildlife, and clean air and water. Current management has improved some conditions on public lands. Resource management emphasis is different among National Forests and BLM Districts across the project area based on the character of the land and resources, public interests, and land use plan decisions.

On National Forests and BLM forested areas, management emphasis is on sustained timber, wood fiber, and livestock forage production in an environmentally prudent manner, while managing and protecting other resources and values. Under this approach, timber harvest and livestock outputs are planned to be near levels produced at the time plans were approved. Timber production is planned only in areas classified as suitable for such production. Because BLM and some National Forest management tends to be more in grass and shrubland areas, the general perspective is to produce forage for livestock grazing, wildlife, and wild horses at or near levels when plans were approved. Under current management, timber and livestock management are coordinated with the maintenance or enhancement of wildlife and fish habitat, scenic quality, recreation opportunities, and other resource values to achieve overall, multiple-use goals and objectives. In general, most lands are open and accessible for mineral resource and gas and oil exploration and development, provided that unnecessary and undue degradation of public lands does not result from operations.

Forestland

Forests feature a diversity of stand conditions. Portions of the landscape are heavily influenced by commodity production and recreation use, while other locations are largely natural appearing. On lands suitable for timber production, forests show evidence of management activity at the stand level. Use of available technologies result in a forest managed to favor early successional species (such as ponderosa pine, lodgepole pine, western larch, Douglas-fir) with reduced stand densities, improved growth and yields, restored and maintained soil productivity, and prompt reforestation achieved with genetically improved trees. Use of prescribed fire and thinning to manage vegetation and reduce fuel loads and ladders is also evident. Some areas emphasize even-aged stand management. Horizontal diversity exists with a variety of stand patch sizes (less than 40 acres) and shapes visible. Stands are in a range of seral structural condition, primarily early (regenerated stands) to middle stages (stands near 20 inches DBH and up to 120 years old). Vertical diversity and a more natural appearing forest, with larger, older trees and several canopy layers, exist in areas where uneven-aged management is emphasized or long rotations are used. As a result of management over the long term, projected annual timber yields of desired timber sizes and quality are produced and long-term timber harvest sustainability is attained. Increased transitory forage will be available for livestock, big game, and other wildlife use.

Rangeland

Grass-shrub uplands evidence steady improvement and positive trends in vegetative and improved structural diversity. Changes have occurred through active grazing management and range betterment activities. As a result, authorized livestock forage use levels are near current levels, and output levels are maintained on a sustained basis.

Upland soils exhibit infiltration and permeability rates that are appropriate to soil types, climate, and landform. Riparian-wetland areas are in properly functioning condition. Stream channel morphology (including but not limited to gradient, width/depth ratio, channel roughness and sinuosity) and functions are appropriate for the climate and landform. Healthy, productive, and diverse populations of native species exist and are maintained.

Disturbances

As a result of prescribed fire, thinning, and insect abatement efforts, the health, vigor, and diversity of the forest has improved and ecosystems are healthier. Resistance to epidemics has increased and undesirable impacts of insects, diseases, and weeds have been mitigated through integrated pest management.

Wildlife Habitat

The amount and diversity of wildlife habitat is maintained or improved. Late/old seral forests and grass-shrublands exist in varying sized blocks and well distributed patterns across the landscape. Snags and dead/downed tree habitat continues to be available at planned and sustained levels. Some decline in old growth and dead/downed-tree-dependent species populations will occur where intensive forest management activities reduce the total amount of these key habitats. Big game species continue to be featured in many areas. Ongoing management of forest and rangeland habitat components and conditions (such as vegetative cover, forage, and roads) and key areas maintain big game populations near State wildlife agency objectives. Hunting continues to be enjoyed throughout the region. Improved forest, grass-shrubland, and riparian area conditions support and benefit a variety of other species by increasing the quality, quantity, and variety of habitat. Such species include waterfowl, upland game, raptors, and nongame species. Management has helped to create the long-term changes and improvements that contribute toward restoring some sensitive species, and toward recovery of several listed species.

Soil and Water

Across the region, soil function, processes, and productivity are maintained or improved through application of prevention, mitigation, or restoration measures. Effective ground cover is present in amounts and distribution to prevent erosion. Water quality is enhanced through management, so that most streams are providing cool, clear, clean water. Quality water is even more precious than at present; demand will be high from all users. However, the available water supply from forests and rangelands remains essentially unchanged, although summer low flows are increased. In the long term, air quality is good. Although use of prescribed burning has increased, application of best management practices, expanded fiber use, and reduced catastrophic wildfire contribute toward quality air.

Protection and maintenance of soil and water resources and productivity is emphasized by all National Forests and BLM Districts.

Riparian Areas

Riparian areas and stream habitat conditions have improved as a result of protection and management, including extensive stream habitat enhancement and restoration work. Management has promoted desirable riparian vegetative species, density and structural conditions, floodplain and bank stability and resiliency, appropriate sediment budgets and water temperatures, and channel morphological processes and characteristics. All conditions interact to support improved habitat, benefiting fish and wildlife across the region. Improved riparian and instream conditions move fish habitat capability toward its potential. Some previously imperiled and other sensitive fish species show an increasing or stable trend in abundance and distribution.

Uses are coordinated to enhance fisheries, water quality, and riparian resources, focusing on maintaining, protecting, and restoring natural functions to achieve healthy and productive ecological conditions. Many Forests and BLM Districts plan to maintain or enhance fish habitat capability and riparian resources, often through restoration and improvement activities.

Social and Economic

Many forested areas include Wilderness, scenic areas, Research Natural Areas, unroaded lands, old-growth reserves, and other locations not subject to timber management activities. These areas would be influenced by fire and other disturbances, recreation, and other uses. Larger expanses of forests in mid- to late-seral stages with closed canopies are evident, with patches of intolerant or climax species. Other areas will show more open, sub-climax seral stages due to extensive use of prescribed fire. Some areas show evidence of younger seral stages due to stand-replacing wildfire and timber harvest. Prescribed and natural fires and other activities have reduced evidence of forest insects and diseases in most areas.

All plans identify areas where varied recreational opportunities from Wilderness, special interest areas, non-motorized and roadless areas, and motorized dispersed activities are provided. National Forests and BLM Districts also provide developed recreation areas and facilities and have programs that seek to maintain scenic quality. Certain lands and features are identified

and incorporated into a system of classified or special interest areas, Areas of Critical Environmental Concern, or Research Natural Areas to protect and manage unique values such as scenic quality, wildlife, raptors, sensitive plants, historical sites, cultural resources, recreation opportunities, and others. Wilderness and Wild and Scenic Rivers have also been designated, or found administratively suitable for designation, and managed to conserve their values.

Changing forest and rangeland conditions also influence recreation activities, settings, and experience opportunities. At the same time, demand for recreation of all types will grow substantially. Both agencies respond to this increased demand by providing additional recreation opportunities. In some areas heavily used and very popular roads provide a base of roaded recreation. In other areas, increased road closures provide for more primitive or semi-primitive opportunities. Additional developed facilities, restored and maintained recreation sites, expanded and well maintained trail systems, and new winter use areas are a few of the means used to meet the demand. Visual quality will be emphasized in the important recreation and related areas; natural appearing conditions featuring larger trees or other desirable vegetation will be created and maintained through management. Some reduction in the amount of unroaded area has occurred, but Wilderness, unroaded, and other areas continue to meet some of the demand for primitive opportunities across the region. However, frequency of encounters will be noticeably increased. All areas continue to emphasize their feature attractions such as wild rivers; scenic areas; wildlife and fish; botanical, geologic, and historical areas; and interpreted cultural resource properties.

The traditional industries that use and produce resources from public lands continue to contribute to rural economic activity. Economic activity is focused on recreation, timber, livestock forage, water, and other locally and regionally important resources.

Alternative 2

Theme

This alternative applies recent interim direction as the long-term strategy for lands managed by the Forest Service or BLM. The interim direction was developed to retain options for management of affected Federal lands while this environmental impact statement was being developed. Specific direction is described in the following decision notices:

- Implementation of Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH), February 24, 1995, as amended by the Forest Service September 11, 1996 and by the BLM January 31, 1997. Inland Native Fish Strategy (INFISH), July 31, 1995.
- Inland Native Fish Strategy (INFISH), July 31, 1995.

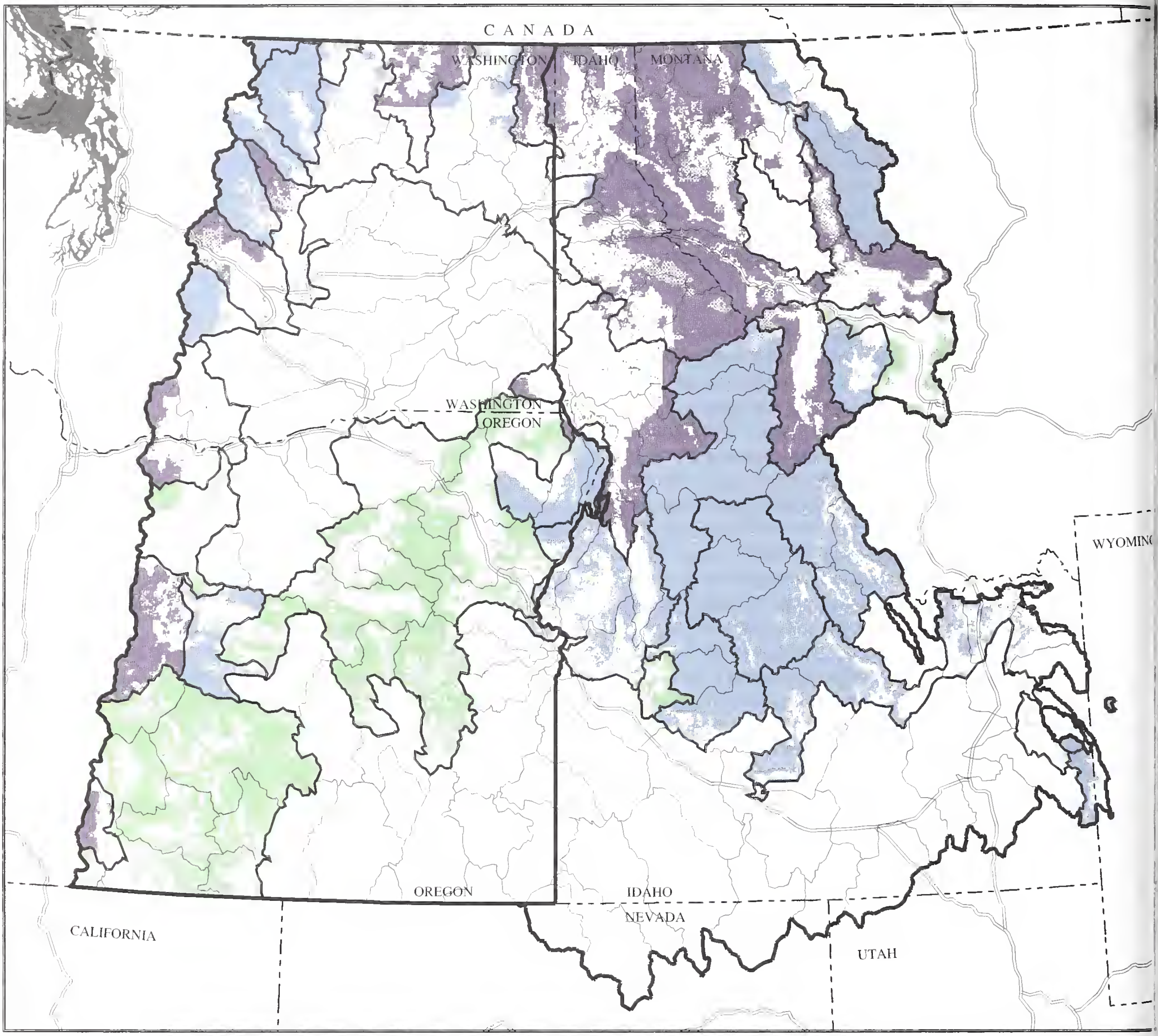
The interim direction emphasizes protection and maintenance of aquatic riparian and wildlife resources while using conservative approaches to management. Direction for PACFISH and INFISH does not overlap. All other direction from current plans (Alternative 1) would continue into the future. In addition, the BLM has issued Statewide Instruction Memoranda for the conservation of bull trout habitat in the project area. Direction described in Alternative 1 applies to those areas not covered by interim direction.

What is the Design of Alternative 2?

The basic philosophy and approaches to management in Alternative 2 are the same as Alternative 1, with the exception of more conservative management strategies applied in this alternative (see maps 3-4 and 3-5). The additional emphasis is on the protection and maintenance of aquatic and riparian resources throughout the project area.

Activity tables (tables 3-6 and 3-7) are presented for each forest and range cluster by alternative to aid in analysis of effects and for projection of outcomes if Alternative 2 were selected.

Due to the emphasis and mix of Conserve strategies (see following table), planned output levels for timber and wood fiber are less than Alternative 1, with only forest clusters 3 and 4 at relatively moderate levels and all others at low levels. This, in part, reflects the effect of the fisheries strategies. Livestock production is planned at relatively high levels in range clusters 2 and 3 and moderate in all others. Management



Map 3-4.
Alternative 2
Management Emphasis
for Forest Clusters

BLM and Forest Service
Administered Lands Only

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996

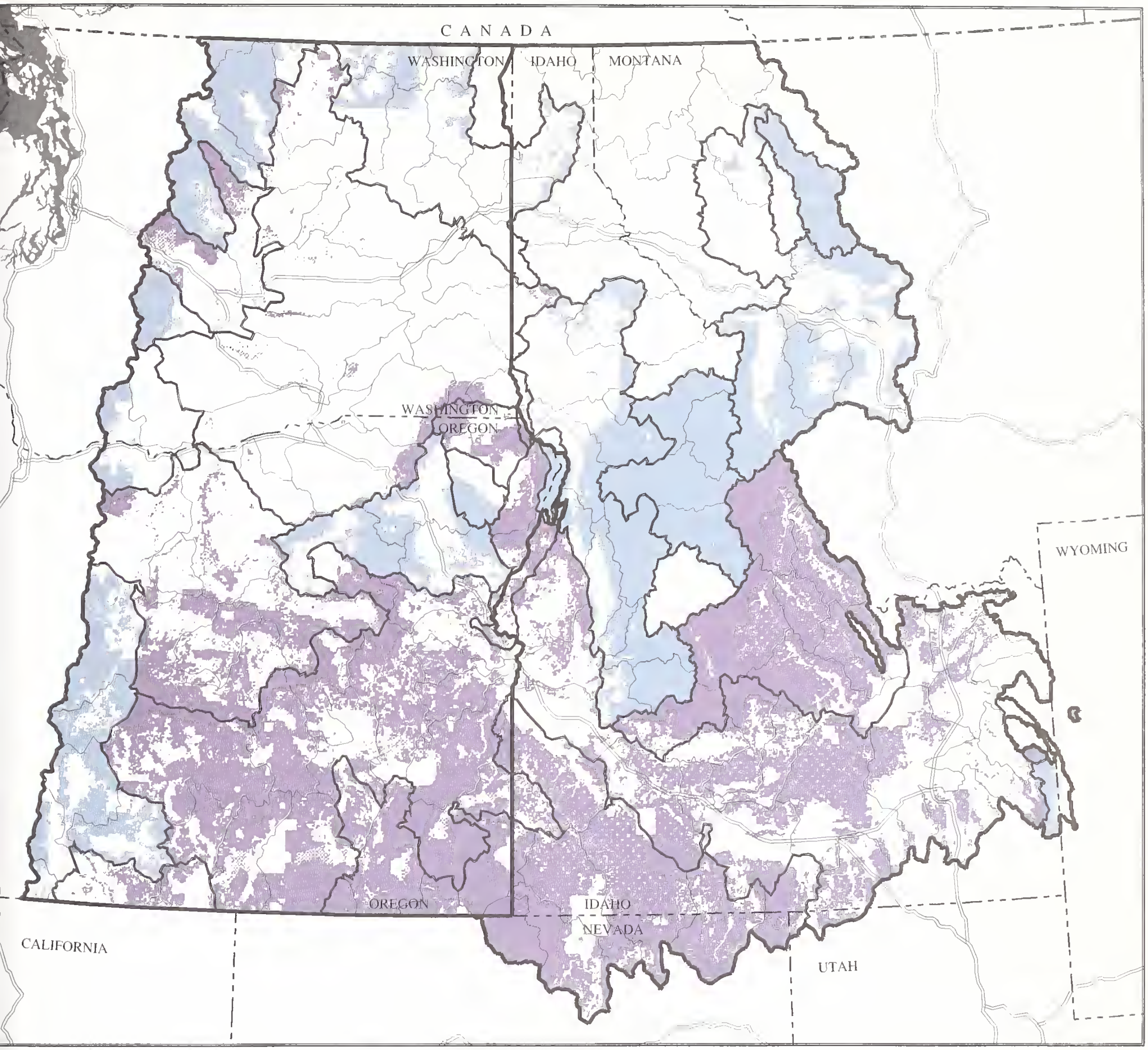
50 0 50 100 150 miles

50 0 50 100 150 km

N

Conserve
Conserve / Restore
Restore
Restore / Produce
Produce
Produce / Conserve

4th HUC Boundaries
Major Roads
EIS Area Border
Cluster Boundary



Map 3-5. Alternative 2 Management Emphasis for Range Clusters

BLM and Forest Service Administered Lands Only

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Project Area
1996

50 0 50 100 150 miles

50 0 50 100 150 km

N

- Conserve
- Conserve / Restore
- Restore
- Restore / Produce
- Produce
- Produce / Conserve
- 4th HUC Boundaries
- Major Roads
- EIS Area Border
- Cluster Boundary

of other resources and values is also intended to be the same as Alternative 1.

Planned restoration management activities are nearly the same as Alternative 1 in forest clusters, with most being at relatively low levels. Within range clusters all restoration activities are planned at relatively low levels with the exception of prescribed natural fire at relatively high levels (same as Alternative 1).

The basic approach to management of wildlife habitat described in Alternative 1 applies to the upper Columbia River Basin Draft EIS area.

Aquatic requirements from PACFISH/INFISH are incorporated throughout most of the project area including:

- ◆ Establishing riparian habitat conservation areas (RHCAs; referred to as riparian conservation areas [RCAs] in this document) and riparian management objectives (RMOs);
- ◆ Incorporating associated project and site-specific standards and guidelines for resource management applied to RHCAs and upland areas affecting riparian areas;
- ◆ Designating key/priority watersheds or protection/restoration activities;
- ◆ Using ecosystem analysis at the watershed scale; and
- ◆ Focusing watershed restoration on degraded habitats to improve long-term conditions.

These requirements provide a consistent approach to aquatic habitat management within most of the project area.

Map 3-3, earlier in this chapter, shows areas where ecosystem analysis is required under Alternative 2.

Desired Range of Future Conditions

Under Alternative 2, forests and rangelands managed by the Forest Service and BLM continue to provide a mix of natural resource based goods and services. Rangelands show improving conditions and trends discussed in Alternative 1 desired future conditions. On forest areas not subject to timber management activities, desired future conditions are also the same as described in Alternative 1. On areas subject to timber management and/or areas within designated riparian areas of key/priority watersheds, some differences in desired range of future conditions (from Alternative 1) apply.

The following desired range of future conditions applies to Forest Service- or BLM-administered lands subject to the management identified in PACFISH and INFISH. The desired range of future conditions is to maintain or restore:

- ◆ Healthy and productive riparian and aquatic ecosystems provide high water quality;
- ◆ Stream channel integrity, channel processes, and the sediment regime (including the elements of timing, volume, and character of sediment input and transport) under which the riparian and aquatic ecosystems developed;
- ◆ Instream flows to support healthy riparian and aquatic habitats, the stability and effective functioning of stream channels, and the ability to route flood discharges;
- ◆ Natural timing and variability of the water table elevation in meadows and wetlands;
- ◆ Diversity and productivity of native and desired non-native plant communities in riparian zones;
- ◆ Riparian vegetation to: (1) provide an amount and distribution of large woody debris characteristic of natural aquatic and riparian ecosystems, (2) provide adequate summer and winter thermal regulation within the riparian and aquatic zones, and (3) help achieve rates of surface erosion, bank erosion, and channel migration characteristic of those under which the communities developed;
- ◆ Riparian and aquatic habitats necessary to foster the unique genetic fish stocks that evolved within the specific geoclimatic region; and
- ◆ Habitat to support populations of well-distributed native and desired non-native plant, vertebrate, and invertebrate populations that contribute to the viability of riparian-dependent communities.

Features Common to Alternatives 3 through 7

HELP?

See the User's Guide at the end of Chapter 3.

Goals

Goals are the foundation for developing alternatives. They are broad general statements of intent that aren't quantified or time specific. A set of goals common to all alternatives was developed because it is recognized that any ecosystem management strategy must simultaneously achieve a number of common conditions and outcomes. Goals were derived from consideration of the Project Charter, initial drafts of the Purpose and Need, and public and agency issues identified through the scoping process. All action alternatives address the goals to some degree and in varying amounts of time, but not all will meet the goals equally; some will be more successful at meeting a goal than will others. The goals were used to develop the evaluation criteria which are discussed as part of the analysis of consequences in Chapter 4 and summarized in table 3-9 later in this chapter.

Desired Range of Future Conditions

The condition of terrestrial and aquatic ecosystems in the project area reflects widely held social values and Indian trust responsibilities. Widely-held social values are most tangibly represented by federal statues, such as the Endangered Species Act, Clean Air Act, Clean Water Act, National Forest Management Act, and the regulations developed for their implementation. In this document, the condition of terrestrial and aquatic ecosystems is addressed through the desired range of future conditions (DRFCs) that deal with forest and rangeland vegetation cover types, structures, disturbance patterns, and wildlife habitats; and with watershed processes, riparian conditions, and aquatic species habitats.

The desired range of future conditions is a vision of the long-term condition of the land, portrayed in this document as a range of conditions expected to result in 50 to 100 years if objectives are achieved.

The following desired range of future conditions applies to Alternatives 3–7. In addition, each alternative will be described by a specific desired range of future conditions that is expected in 50 to 100 years.

Soils

- ◆ Most soils have at least minimal protective cover, soil organic matter, and coarse woody material (in woodlands and forests). Soils have adequate physical properties for vegetation growth and hydrologic function. Physical, chemical, and biological processes in most soils function similarly to soils that have not been harmfully disturbed.
- ◆ Degradation of soil quality and loss of soil productivity is prevented.
- ◆ Soil hydrologic function and productivity in riparian areas is protected, preserving water quality buffering and regulation of nutrient cycling.
- ◆ Soil productivity, quality, and function are restored.

Alternative 2 - Management Emphasis Within Forest and Range Clusters for the Project Area

	Forest Cluster		Range Cluster	
	% of Forest Cluster	Cluster No.	% of Range Cluster	Cluster No.
Management Emphasis				
Conserve	43	1, 2, 6	33	2, 3
Conserve/Restore	26	5	NA	NA
Produce/Conserve	31	3, 4	67	1, 4, 5, 6

Terrestrial Ecosystems

◆Vegetation and fuel management strategies reduce the risk of life and property loss from wildfire.

◆In the *dry forest* type, stand density, species composition, structure, fuel loading and distribution, and duff depth are moving toward a characteristic fire regime. The majority of fires are nonlethal underburns, generally occurring on more gentle terrain and rocky areas at less than 25-year intervals. Some lethal fires, which kill the overstory, continue to occur where topography funnels winds, in geographically windy areas, or on low productivity sites where trees rarely become tall enough for their crowns to survive flames. The smallest proportion of fires are of mixed severity.

◆Dominant species in the dry forest type are resistant to low intensity fires. Stands of ponderosa pine are pure or mixed with western larch, Douglas-fir, or grand fir. The dry forest group is predominately an open community.

◆In the *moist forest* type, mixed severity fires occur intermingled with surface and crown fires. Stand density, species compositions, structure, fuel loading and distribution, and duff depth are moving toward that which is associated with the highly variable fire regime. The majority of fires are mixed severity at intervals ranging from 25 to 150 years. Nonlethal fires occur on benches and ridges, and fires lethal to the overstory occur on upland slopes.

◆Dominant species in the moist forest type are resistant to low and moderate intensity fires. Stands of Douglas-fir, lodgepole pine, ponderosa pine, or western larch are pure or mixed with western white pine, grand fir/white fir, western hemlock/western red cedar, or Engelmann spruce/subalpine fir.

◆In the *cold forest* type, stand density, species composition, structure, fuel loading and distribution, and duff depth are moving toward a characteristic fire regime. Nonlethal underburns occur on benches and ridges where whitebark and lodgepole pine dominate. The lethal crown fire regime is found on moist to wet steep slopes. The most common fires are mixed severity, which usually occur intermingled with nonlethal and lethal fires during one or a series of fire events, with a frequency ranging from 25 to 150 years.

◆Dominant species in the cold forest type are somewhat resistant to low intensity fires. Stands of lodgepole pine, Douglas-fir, or whitebark pine are pure or mixed with Engelmann spruce/subalpine fir, mountain hemlock, whitebark pine/subalpine larch, or aspen.

◆Through time, dry and moist forest potential vegetation groups are improving in basic health, especially where the historical effects of harvest, fire exclusion, and road practices are not in sync with biophysical disturbances regimes and goals for the area.

◆Dry and moist forest potential vegetation groups in the rural/wildland interface are managed to maintain mature and old single layer, open low density mid-seral forest or early seral physiognomic types, as appropriate to the biophysical environment (consistent with

Goals for Alternatives 3 through 7

Goal 1 ~	Sustain and where necessary restore the health of forest, rangeland, aquatic, and riparian ecosystems.
Goal 2 ~	Provide a predictable, sustained flow of economic benefits within the capability of the ecosystem.
Goal 3 ~	Provide diverse recreational and educational opportunities within the capability of the ecosystem.
Goal 4 ~	Contribute to recovery and delisting of threatened and endangered species.
Goal 5 ~	Manage natural resources consistent with treaty and trust responsibilities to American Indian tribes.

structure, tables 3-1 to 3-4), to reduce potentials for fires that crown, spread rapidly, and/or burn with high intensity, and reduce hazards to rural development. Some areas are managed to be inconsistent with the native biophysical template to produce desired fire hazard reductions.

- ◆ In dry and moist forest potential vegetation groups not in the rural/wildland interface zone, where the emphasis is to manage for maintenance of native patterns and processes (for example, Wilderness, semi-primitive areas), native fire regimes are maintained through prescribed fire and harvest (where appropriate).
- ◆ Progress is being made in restoring western white pine on suitable environments by regeneration with blister rust resistant stock.
- ◆ Management is proactive to avoid introduction or spread of exotic and noxious weeds in the dry and moist forest potential vegetation groups.
- ◆ The spread of noxious weeds is contained and ecologically sound methods of control are applied throughout the region.
- ◆ Habitats are suitable to maintain viable populations of listed and sensitive species.
- ◆ Natural Areas and habitats supporting high species endemism or biodiversity are present and contribute to viable populations.
- ◆ Healthy, productive, and diverse populations of plants and animals are maintained or restored.
- ◆ Dense shrublands are reduced in extent.
- ◆ Encroachment of juniper and conifers is declining.
- ◆ Shrub communities are of sufficient size and of appropriate arrangement to enhance connectivity among similar habitats.
- ◆ Most rangelands seeded with mixtures including predominately non-native plants are functioning to maintain life form diversity, production, nutrient cycling, energy flow, and the hydrologic cycle.
- ◆ Until feasible cost-effective rehabilitation treatments are developed, communities of undesirable exotic plants will meet minimum requirements of soil stability and maintenance of existing native and seeded plants.

Aquatic Ecosystems

- ◆ Riparian areas and wetlands (both standing and moving water) are within the range of properly functioning condition.
- ◆ Water quality meets Clean Water Act requirements, EPA-approved State and tribal water quality standards, and contributes to habitat quality and stream and lake conditions. Existing instream water uses and the level of water quality, necessary to protect the existing uses, are maintained and protected.
- ◆ High quality waters constituting an Outstanding Resource Water, as identified by a State or tribe, are maintained and protected.
- ◆ There are fewer roads in riparian areas and uplands, where roads causing accelerated erosion have been reduced. Most riparian areas are stable and are subjected to natural streamflow and sediment regimes. In some areas, open roads are stable.
- ◆ Watersheds provide for natural infiltration, retention, and release of water appropriate to soil type, vegetation, climate, and landform.
- ◆ Riparian/wetland vegetation structure and diversity are making substantial progress toward controlling erosion, stabilizing stream banks, shading water areas, filtering sediment, aiding in floodplain development, dissipating energy, delaying flood water, and increasing recharge of groundwater appropriate to climate, geology, and landform.
- ◆ Stream channels and floodplains are functioning properly relative to the geomorphology (for example, gradient, size, shape, roughness, confinement, and sinuosity) and climate. Soils support native riparian and wetland vegetation to allow water movement, filtration, and storage.
- ◆ Surface and groundwater on public lands fully support, or are making substantial progress toward fully supporting, designated beneficial uses described in the Water Quality Standards of the States of Idaho, Montana, Wyoming, Utah, and Nevada.

Human Uses and Values

- ◆ Forest Service- and BLM-administered lands efficiently provide a mix of economic and cultural benefits to people that balances local, regional, national, and international

interests. The provision of benefits accounts for differences in social and economic relationships between these interests and the use of agency lands. Benefits are provided in type, amount, distribution, and regularity that is generally regarded as fair, well-reasoned, and conducive to predictable use. The mix of benefits supplied is responsive to changing public values and the comparative ability of agency-administered lands to supply goods and services relative to other suppliers. Benefits are produced in accordance with federal statutes and regulations, which most frequently address issues of efficiency, sustainability, supplying goods and services important to people, and consideration for local economic conditions.

◆ Economic activity is generated in rural communities, including private sector employment, agency employment, income, number of recreation visits, and revenues shared with local governments.

◆ Because patterns of disturbance (fire, insect, disease, tree windthrow, flood) trend toward being less extreme and more predictable, they present fewer threats of loss of human life and property and less risk of degradation of environmental conditions valued by people, especially at the wildland-urban interface zone.

◆ State and Federal resource management-related legal requirements are met.

◆ A broad range of recreational opportunities is available.

◆ Air quality eomplies with Clean Air Act requirements.

◆ Forest Service and BLM managers and planners use a mix of formal and informal mechanisms for including people in land use decisions, in the implementation of land use plans, and the monitoring of results. The Forest Service and BLM continually adapt mechanisms for including people to meet changing needs and conditions and improve effectiveness. Mechanisms provide opportunities for sharing knowledge, giving input, coordinating, and collaborating. The participation needs of tribal, local, and state governments, federal agencies, special interest groups, and the general public (local, regional, and national) are explicitly recognized and accommodated.

American Indians

◆ Tribal treaty rights and other Federal trust responsibilities are met.

◆ Tribal governments are involved in Federal agency planning, decision-making, and implementation of programs.

◆ Agencies recognize the tribes' right to self-determination and control of their resources and their relationship both among themselves and with non-Indian governments, organizations, and persons.

◆ There is an interconnected balance of physical landscape components, including upland terrestrial habitats, riparian areas, wetlands and clear, clean, cold water.

◆ Functional restoration of the ecosystem provides the capability to support harvestable levels of species of interest to the tribes.

◆ Culturally significant items and sites are understood and treated within the context of the culture that identifies and values them.

Alternative 3

Theme

This alternative updates existing Forest Service and BLM plans in response to changing conditions (such as declining forest and rangeland health, local economies at risk, and declining salmon runs), while minimizing changes to local plans and relying on local public needs and desires. Each National Forest or BLM unit would emphasize local public input to determine a desired mix of uses, services, and restoration and management actions consistent with ecosystem principles to incorporate into the land-use plans. Direct involvement with other federal agencies, and State, county, and tribal governments will be used in planning, decision-making, and implementation of programs.

The emphasis in this alternative is to make the minimal amount of repairs to existing plans that would allow them to be more effective, integrated, and consistent in the face of changed ecological conditions and increasing numbers of appeals and lawsuits. Only those priority conditions that most hinder the effectiveness of

Alternative 3 - Management Emphasis Within Forest and Range Clusters for the Project Area

	Forest Cluster		Range Cluster	
	% of Forest Cluster	Cluster No.	% of Range Cluster	Cluster No.
Management Emphasis				
Conserve	NA	NA	8	2
Conserve/Restore	28	1, 6	25	3
Restore	54	2, 3, 5	19	5
Restore/Produce	18	4	48	1, 4, 6

existing plans are addressed in this alternative and distinguish it from the no-action alternative (Alternative 1). This alternative provides a broader dimension and more integrated management direction regarding priority large-scale issues that cross administrative boundaries than do Alternatives 1 or 2.

What is the Design of Alternative 3?

Alternative 3 emphasizes a mix of restoration strategies for management of Forest Service- and BLM-administered lands. See maps 3-6 and 3-7.

Activity tables (tables 3-6 and 3-7) are presented for each forest and range cluster by alternative to aid in analysis of effects and for projection of outcomes if Alternative 3 were selected.

In general, moderate levels of restoration activity are planned under this alternative (see table below). The primary focus of forest vegetation restoration is on forest clusters 3, 4, and 5 with a particular emphasis on dry forest in forest cluster 5. Within the clusters, the intent is to restore vegetation to appropriate conditions on high priority sites. Forest restoration is aimed at improving the range of composition, density, structure, and patterns toward those more appropriate for the forest type and restoring more typical and predictable fire and other disturbance regimes. Management tools expected to be used in restoration activities include mechanical, fire, and harvest methods.

Range vegetation restoration activity is planned at moderate to moderately low levels. The intent of range restoration is to maintain and/or improve and increase biodiversity and productivity of native range plant communities through containment of noxious weeds, management of juniper, and increased use of prescribed fire.

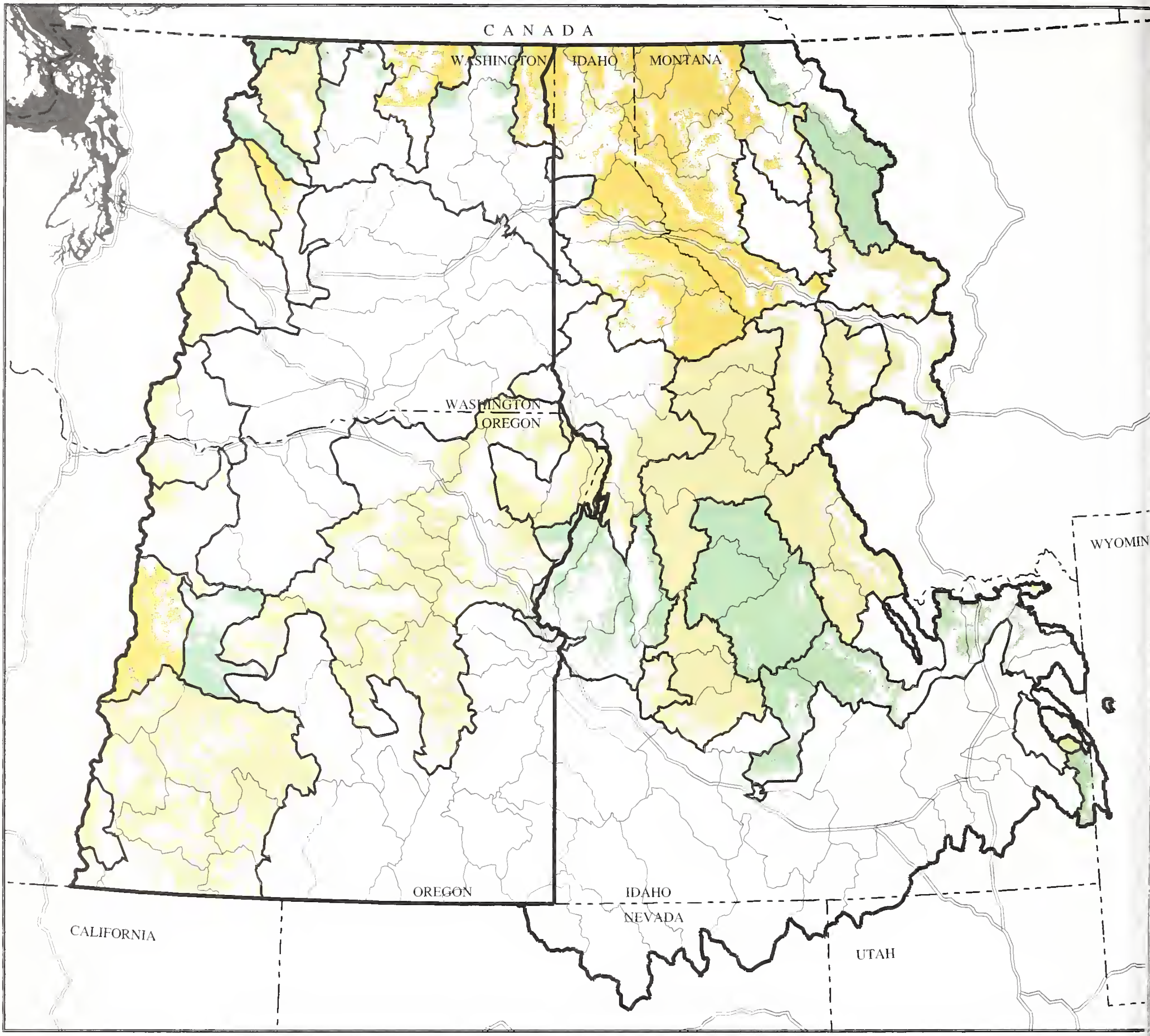
Except for forest clusters 1 and 2, forest production is expected to occur across all forest clusters in the basin at relatively moderate levels, some resulting from restoration activities. Grazing management would vary from low to high with the highest levels expected in range cluster 5. Both resource production activities are expected to be accomplished in a manner that is environmentally appropriate and supports achievement of objectives. Management of recreation, scenic integrity, and other resources and values is generally similar to Alternative 1, except where modified by direction that takes an integrated approach to protecting water, soil, aquatic, riparian, and/or terrestrial resources.

Management of habitat features important for wildlife species, within specified ranges, is aimed at maintaining (or achieving) viable vertebrate populations.

Under Alternative 3, the aquatic strategy is based on objectives for three subbasin categories (see Map 2-25) and RCAs and RMO values from PACFISH and INFISH. Resource management direction is similar to PACFISH and INFISH. The aquatic conservation focus is to conserve Category 1 subbasins, protect or restore habitat for wild chinook salmon and steelhead, native trout strongholds, and other listed and special status riparian dependent or aquatic species and protect or restore water quality to support beneficial uses. Potential ecosystem analysis areas are shown on Map 3-8.

Desired Range of Future Conditions

In addition to the desired range of future conditions elements common to all action alternatives, the following is the vision of the long-term (50 to 100 years) condition of the land under Alternative 3:

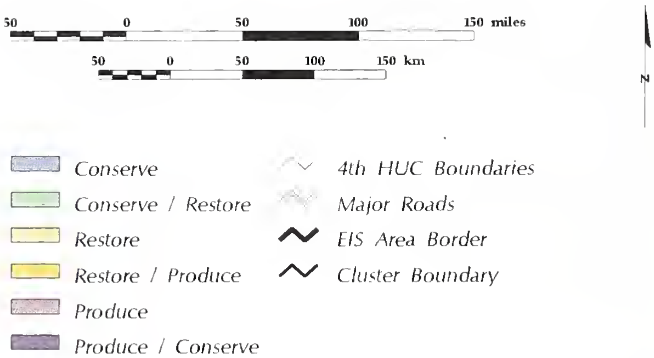


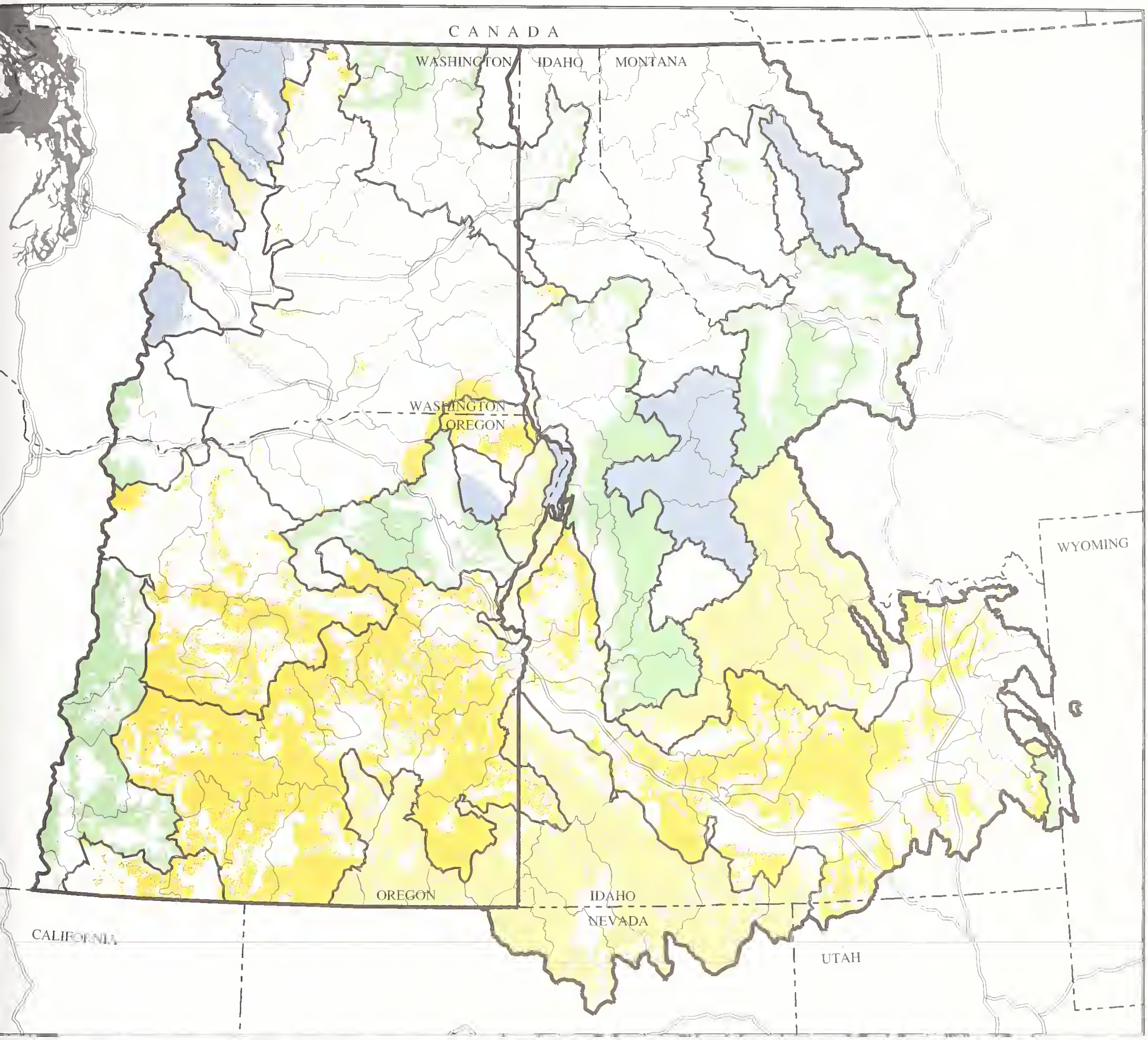
Map 3-6. Alternative 3 Management Emphasis for Forest Clusters

BLM and Forest Service Administered Lands Only

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Project Area
1996



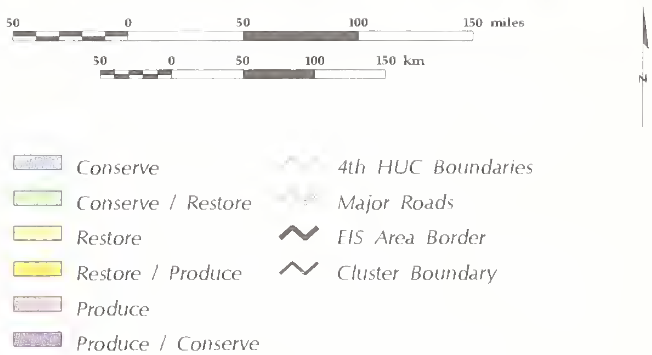


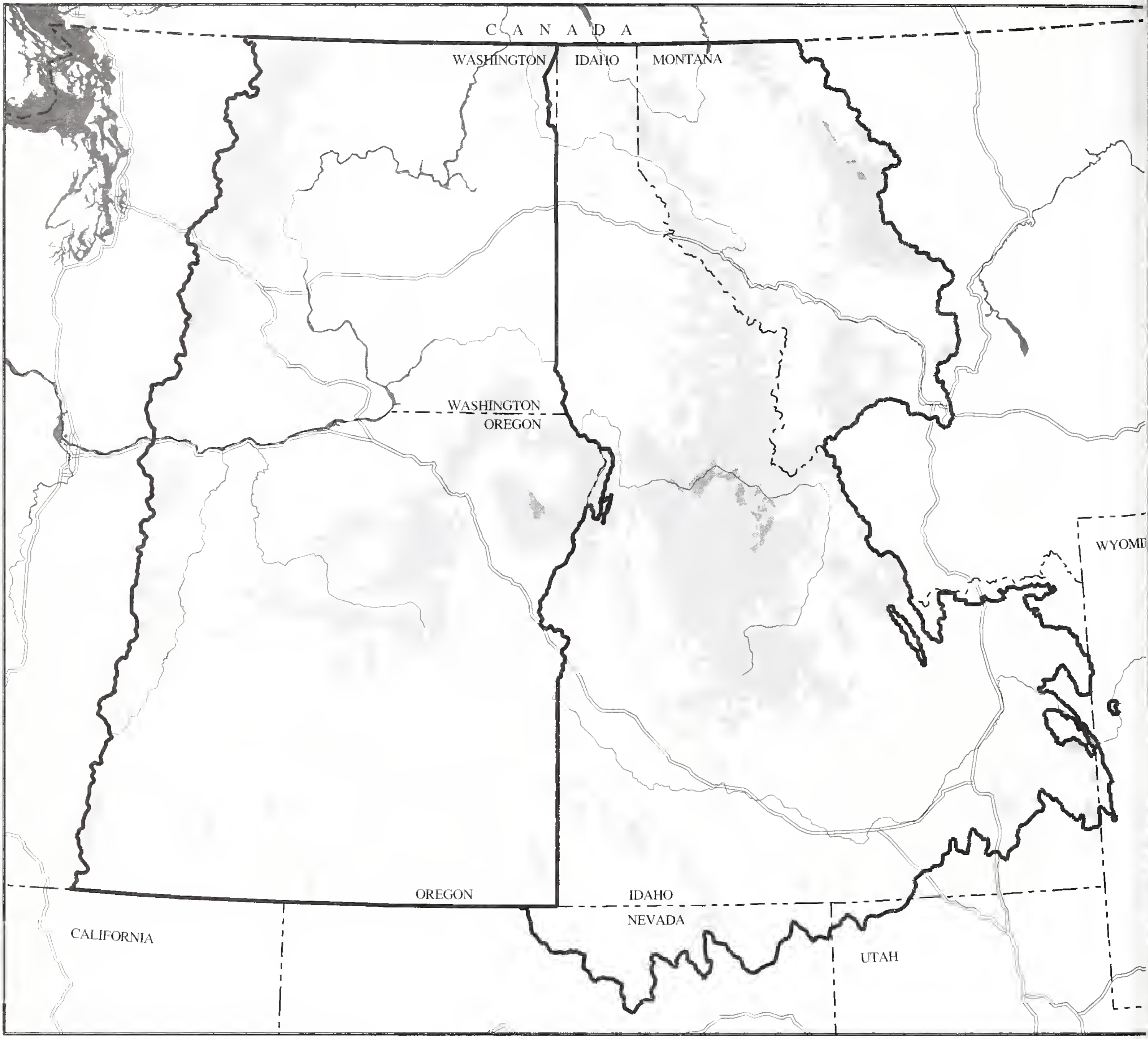
Map 3-7. Alternative 3 Management Emphasis for Range Clusters

BLM and Forest Service Administered Lands Only

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Project Area
1996

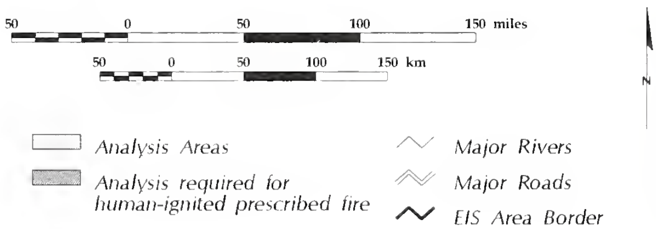




Map 3-8.
Alternative 3
Potential Areas for Ecosystem Analysis at the Watershed Scale

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996



Ecosystem Analysis at the Watershed Scale is required before management activities in Category 1 sub-basins or in stronghold subwatersheds, bull trout fringe subwatersheds, subwatersheds containing wild populations of steelhead or ocean-type or stream-type chinook salmon, or Snake River salmon, or bull trout High Priority Watersheds.

Terrestrial Ecosystems~Forestlands

Dry Forest Potential Vegetation Group. In the dry forest potential vegetation groups, successional and disturbance processes are maintained through endemic insect and disease disturbances, vegetation management on high priority sites to reestablish dominance of single story ponderosa pine, and fire.

There is a moderate abundance and persistence of mature and old single story forest, dominated by stands resistant to low intensity fires, including ponderosa pine and western larch, with a moderate component of Douglas-fir and a minor component of grand fir. Stands are fairly well distributed in a mosaic of age classes (table 3-1).

Moist Forest Potential Vegetation Group. In the moist forest potential vegetation groups, successional and disturbance processes are maintained through endemic insect and disease disturbances, windthrow often aided by root rot, vegetation management on high priority sites to reestablish western white pine, and fire.

There is a moderate abundance and persistence of young forest consisting of western white pine, western larch, and ponderosa pine with a minor component of grand fir. Stands are distributed in a mosaic of age classes (table 3-1).

Cold Forest Potential Vegetation Group. In the cold forest potential vegetation groups, successional and disturbance processes are maintained through endemic and epidemic insect and disease disturbances, vegetation management on high priority sites to reestablish whitebark pine, and fire.

There is a moderate component of young forest consisting of seral whitebark pine along with Engelmann spruce/subalpine fir. Stands are distributed in large-patch mosaics of age classes (table 3-1).

In dry and moist forest potential vegetation groups not in the rural/wildland interface zone, where an emphasis is to manage for timber production, two to three fire intervals are skipped in underburning (non-lethal) and mixed behavior fire regimes in some areas to accumulate small diameter trees in the understory and moderate closure of larger diameter overstory trees. In crown fire regimes, one to two fire intervals are skipped in some areas to accumulate moderate diameter trees in the overstory with scattered large residual trees.

The forested potential vegetation groups have an overall range of structural stages at the landscape level as follows:

Table 3-1. Desired Seral Stages at the Landscape Level for Alternative 3

PVG	Early	Mid	Mature[1] and Old[2] Multi	Mature & Old Single	Other[3]
Distribution (percentage of PVG)					
Dry	15-25	30-45	10-20	10-30	0-15
Moist	20-30	45-60	10-20	5-10	
Cold	25-35	40-50	10-20	5-15	1-2
Shade-Intolerant Species (percentage of seral stages)					
Dry	70-80	60-70	55-70	75-90	
Moist	65-75	55-65	50-60	55-70	
Cold	55-65	50-60	50-60	85-95	

[1] Mature refers to ages and sizes of dominant trees that are at least at culmination of mean annual increment of tree stand volume growth.
[2] Old refers to ages and sizes of dominant trees that are significantly beyond what may be found at culmination of mean annual increment of tree stand volume growth.
[3] Refers to understory of grasses, shrubs, and forbs.

Forest Wildlife Habitat

The needs of forest-dependent wildlife species are met by the presence of the necessary structures and composition, ecological processes, and ecosystem functions. Most habitats ensure long-term evolutionary potential of native species. Forested land contains habitat attributes of old forests. Habitats of endemics, disjunct, and centers of biodiversity of rare plant and animal species are given consideration to meet these species needs. Natural areas with high species endemism or biodiversity are present and contribute to viable populations and the delisting recovery of threatened or endangered species. Habitats are managed to prevent listing of species given special consideration by land management agencies. Amounts and distribution of habitat attributes are increased where needed, and maintained to meet the needs of endemic species and species with the largest home range requirements. Some blocks of old forest habitats connect areas of similar vegetation. Options are maintained for evolutionary processes at the edge of species

ranges for wide ranging species. Human activities are at levels that allow sufficient useable habitat for all species to be represented and well distributed, although species densities may be variable. Management activities are dispersed, except in areas following major disturbances such as large fires and insect infestations. In many forest areas, some roads are closed (seasonal or permanent), or located to achieve the desired wildlife habitat conditions.

Terrestrial Ecosystems ~ Rangelands

Rangelands reflect a mosaic of multiple-aged shrubs, forbs, and native and exotic perennial grasses. There is a slight management emphasis on maintaining a grass-dominated plant community in the shrublands, although forbs and shrubs are a substantial part of the plant community. Most seedings have been diversified by the addition of various forb and shrub species. New infestations of noxious weeds, especially when located in vegetation types highly susceptible to invasion, are controlled, but some existing large infestations remain and continue to spread along their boundaries. Control that results in some reduction of existing large infestations is prioritized at a site-specific level and directed by local input, especially for species that are problematic on a project area-wide level (yellow starthistle, diffuse knapweed, spotted knapweed, and leafy spurge).

Western juniper and conifers are being reduced by various treatments on rangelands. New invasions as well as existing juniper and conifer dominated sites are being treated.

Prescribed burning and prescribed natural fire is apparent, although the burning is not continuous and is prescribed as mosaic. Altered sagebrush steppe is maintained at existing levels with emphasis on preventing the spread of cheatgrass to adjacent areas. Greenstripping and other fire breaks are apparent along roads and along the altered sagebrush steppe boundaries.

Dry Grass Potential Vegetation Group. Forty to 60 percent of the fires in this group are nonlethal, burning in herbaceous vegetation at less than 25-year intervals. The remaining fires are lethal, or mixtures of nonlethal and lethal, causing mortality of overstory shrubs or conifers. Fifty to 70 percent of the area is dominated by native grasses and forbs with minimal conifer and shrub encroachment.

Dry Shrub Potential Vegetation Group. Forty to 60 percent of the area in this group is dominated by native grasses and forbs with an overstory layer of shrubs. Five to 20 percent of the area is dominated by native grass and forb communities. The remaining area is dominated by dense shrub communities with declining herbaceous layers, by annual grasses, or by seedings of exotic grasses and other plants.

Cool Shrub Potential Vegetation Group. Fifty to 70 percent of the area in this group is dominated by native grasses and forbs with an overstory layer of shrubs. Ten to 30 percent of the area contains mixtures of perennial grasses and forbs. Conifers are dominant on less than 20 percent of the area.

Rangeland Wildlife Habitat

Rangelands have the necessary structure and composition, ecological processes, and ecosystem functions to meet most needs of Federal and State listed and sensitive rangeland-dependent wildlife species. To enhance wildlife forage production, maintenance of native perennial bunchgrass is ongoing. Natural Areas and areas of high species endemism or biodiversity are present and contribute to viable populations, but gains in viable populations are moderate. Vegetation is appropriate for the site with multiple age classes of shrubs and grass being common. These habitats are becoming less fragmented and more connected due to increasing abundance of native vegetation. Blocks of similar habitats are fairly well connected with areas of similar vegetation. Human activities are at a level that allows most species to maintain a desired distribution, but species densities may be low. In many rangeland areas, roads are closed or located to achieve the desired resource conditions. In some situations, human activities require seasonal restrictions in selected habitats.

Aquatic Ecosystems

Riparian areas in proper functioning condition are managed to maintain at least that condition, within their site potential, with no downward trends. Tall trees, moderate or large in diameter, within riparian areas are apparent. Most riparian areas are connected to the streams and uplands, unfragmented by roads and openings, and free of barriers to species migration. On rangelands, most riparian area soils are

vegetated with native deep-rooted plants and shrubs. Riparian woodlands are increasing on forested lands. Wetlands are stable and common across the lower gradient valley bottoms.

Forested streams in category 2 and portions of category 3 sub-basins are moderately productive and habitat is becoming complex and diverse, supporting native aquatic species. Instream, bank, and overhead cover, and structure provided by large wood and willows, are moderate and increasing. Large deep pools in lower gradient streams are fairly common. Rangeland streams and forested streams in portions of category 3 subbasins are moderate in productivity, and have habitat that is mostly complex and diverse, supporting aquatic species. Instream, bank, and overhead cover, and structure provided by large wood and willows, are moderate.

Minor portions of the landscape have minimal protective soil cover, organic matter, and coarse woody material.

Roads in riparian areas are infrequent and stable. Few road corridors from new roads are apparent. The landscape is generally fragmented in appearance.

Aquatic Species Habitat

Water quality and aquatic habitat are moving towards watershed, riparian, and aquatic habitat goals within category 2 and portions of category 3 sub-basins. Restoration strategies are implemented on nearly all high-risk sites within category 2 subbasins, allowing recovery of watershed, riparian, water quality, and aquatic conditions characteristic for the geoclimatic setting. Improved aquatic habitat conditions allow threatened or endangered (TES) aquatic species populations to stabilize and expand. Major river corridor habitat and water quality conditions are improving.

The following desired range of future conditions applies to Forest Service- or BLM-administered lands:

- Water quality to a degree that provides for stable and productive riparian and aquatic ecosystems;
- Stream channel integrity, channel processes, and the sediment regime (including the elements of timing, volume, and character of sediment input and transport) under which the riparian and aquatic ecosystems developed;
- Instream flows to support healthy riparian and aquatic habitats, the stability and effective function of stream channels, and the ability to route flood discharges;
- Natural timing and variability of the water table elevation in meadows and wetlands;
- Diversity and productivity of native and desired non-native plant communities in riparian zones;
- Riparian vegetation to: (a) provide an amount and distribution of large woody debris characteristic of natural aquatic and riparian ecosystems; (b) provide adequate summer and winter thermal regulation within the riparian and aquatic zones; (c) help achieve rates of surface erosion, bank erosion, and channel migration characteristic of those under which the communities developed.
- Riparian and aquatic habitats necessary to foster the unique genetic fish stocks that evolved within the specific geoclimatic region;
- Habitat to support populations of well-distributed native and desired non-native plant, vertebrate, and invertebrate populations that contribute to the viability of riparian-dependent communities.

Human Uses and Values

- Social and economic systems are minimally affected by adjustments or updates to Forest Service or BLM land-use plans.
- Local public needs and desires continue to influence levels of commodity and non-commodity outputs.
- Customary uses continue and stability improves for the participant customers (firms, ranches, etc.).
- Reductions in commodity outputs are minimized and reflect either changes in ecosystem health or minimum levels needed to achieve compliance with applicable laws and regulations.
- Payments to local units of governments continue and generally are stable within a normally accepted range.

Alternative 4

Theme

This alternative is designed to aggressively restore ecosystem health through active management, the results of which resemble endemic disturbance processes including insects, disease, and fire. The alternative focuses on short-term vegetation management to improve the likelihood of moving towards or maintaining ecosystem processes that function properly in the long term. Vegetation management is designed to reduce risks to property, products, and economic and social opportunities that can result from large epidemic disturbance events. Direct involvement with other federal agencies, and State, county, and tribal governments will be used in planning, decision-making, and implementation of programs.

Priority in this alternative is placed on forest, rangeland, and watershed health, assuming that healthy streams, wildlife populations, and economic and social benefits will follow. Actions taken to achieve desired conditions are designed to produce economic benefits whenever practical. A wide variety of management tools are available under this alternative.

What is the Design of Alternative 4?

Restoration strategies are applied in all forest clusters, except forest cluster 1, which has a Conserve/Restore emphasis, and all range clusters except range cluster 2, which also has a Conserve/Restore emphasis. See maps 3-9 and 3-10.

Activity tables (tables 3-6 and 3-7) are presented for each forest and range cluster by alternative to aid in analysis of effects and for projection of outcomes if Alternative 4 were selected.

Emphasis is on a high level of restoration where the dry and/or moist forests are the dominant type. Cold forest types are generally moderate level of restoration.

Restoration on rangelands is generally moderate to moderately high. The emphasis is on active restoration of cool shrublands, dry shrublands, and dry grasslands communities. See table below.

Much of the short-term forest outputs will result from restoration activity. Grazing lands are generally at moderate levels, except for range cluster 2 and 3, which are low. On rangelands, restoration activities are expected to lead to improved range productivity which may lead to some opportunity for increased grazing. Management of recreation, scenic integrity, and other resources and values is encouraged but may be affected by restoration or protection requirements.

In Alternative 4, restoration is aimed at achieving or maintaining a moderate to high amounts of habitats and their associated features within desired ranges, important for animals and plants.

The aquatic strategy for Alternative 4 features objectives for three subbasin categories and RCAs and RMO values developed from information collected for the *Scientific Assessment*. Resource management direction is similar to Alternative 3. The aquatic strategy is aimed at conservation of Category 1 subbasins; maintenance of water quality; and restoration, maintenance, and protection of riparian-dependent and aquatic species habitat. Subbasin review is used to strategically prioritize watersheds for Ecosystem Analysis which provides the context and coordination to accomplish protection or restoration of aquatic and riparian resources and water quality. This alternative places emphasis on a high rate of watershed restoration to improve stream, riparian, soil and upland process and functions.

Alternative 4 - Management Emphasis Within Forest and Range Clusters for the Project Area

	Forest Cluster		Range Cluster	
	% of Forest Cluster	Cluster No.	% of Range Cluster	Cluster No.
Management Emphasis				
Conserve/Restore	10	1	8	2
Restore	90	2, 3, 4, 5, 6	92	1, 3, 4, 5, 6

Map 3-11 shows areas under Alternative 4 where ecosystem analysis is potentially required.

Watershed restoration is moderate for Forest Clusters 3, 4, and 5 and high for Forest Clusters 1 and 2; riparian restoration is at moderate levels for all clusters. In riparian-wetland areas, achievement and maintenance of Proper Functioning Condition or better is expected. Road density reductions is generally moderate, except in Forest and Range Clusters 1 and 5 (low road density reduction in Forest Cluster 1 and Range Cluster 5; high in Forest Cluster 5 and Range Cluster 1).

Desired Range of Future Conditions

In addition to the desired range of future conditions elements common to all action alternatives, the following is the vision of the long-term (50 to 100 years) condition of the land under Alternative 4.

Terrestrial Ecosystems~Forestlands

Dry Forest Potential Vegetation Group. In the dry forest potential vegetation groups, early successional stages are maintained and disturbance processes are restored through aggressive vegetation management, endemic insect and disease disturbances, and fire.

There is an abundance and persistence of mature and old single story forest stands resistant to low intensity fires, dominated by ponderosa pine and western larch, with a moderate component of Douglas-fir and a minor component of grand fir. Stands are well distributed in a mosaic of age classes (table 3-2).

Moist Forest Potential Vegetation Group. In the moist forest potential vegetation groups, early successional stages are maintained and disturbance processes are restored through aggressive vegetation management; endemic insect and disease disturbances; windthrow, often aided by root rot; and fire.

There is an abundance and persistence of mature and old forest dominated by Douglas-fir, lodgepole pine, and ponderosa pine in the single story structural stage. Early successional western white pine dominates the young forest structural stage. Stands are well distributed in a mosaic of age classes (table 3-2).

Cold Forest Potential Vegetation Group. In the cold forest potential vegetation groups, early successional stages and disturbance processes are maintained through endemic insect and disease disturbances, vegetation management, and fire.

There is an abundance and persistence of mature and old forest dominated by lodgepole pine and Douglas-fir in the multi-story structural stage, and the young forest stages are dominated by early successional whitebark pine with a moderate component of Engelmann spruce/subalpine fir. Stands are distributed in large-patch mosaics of age classes (table 3-2).

The forested potential vegetation groups have an overall range of structural stages at the landscape level as follows:

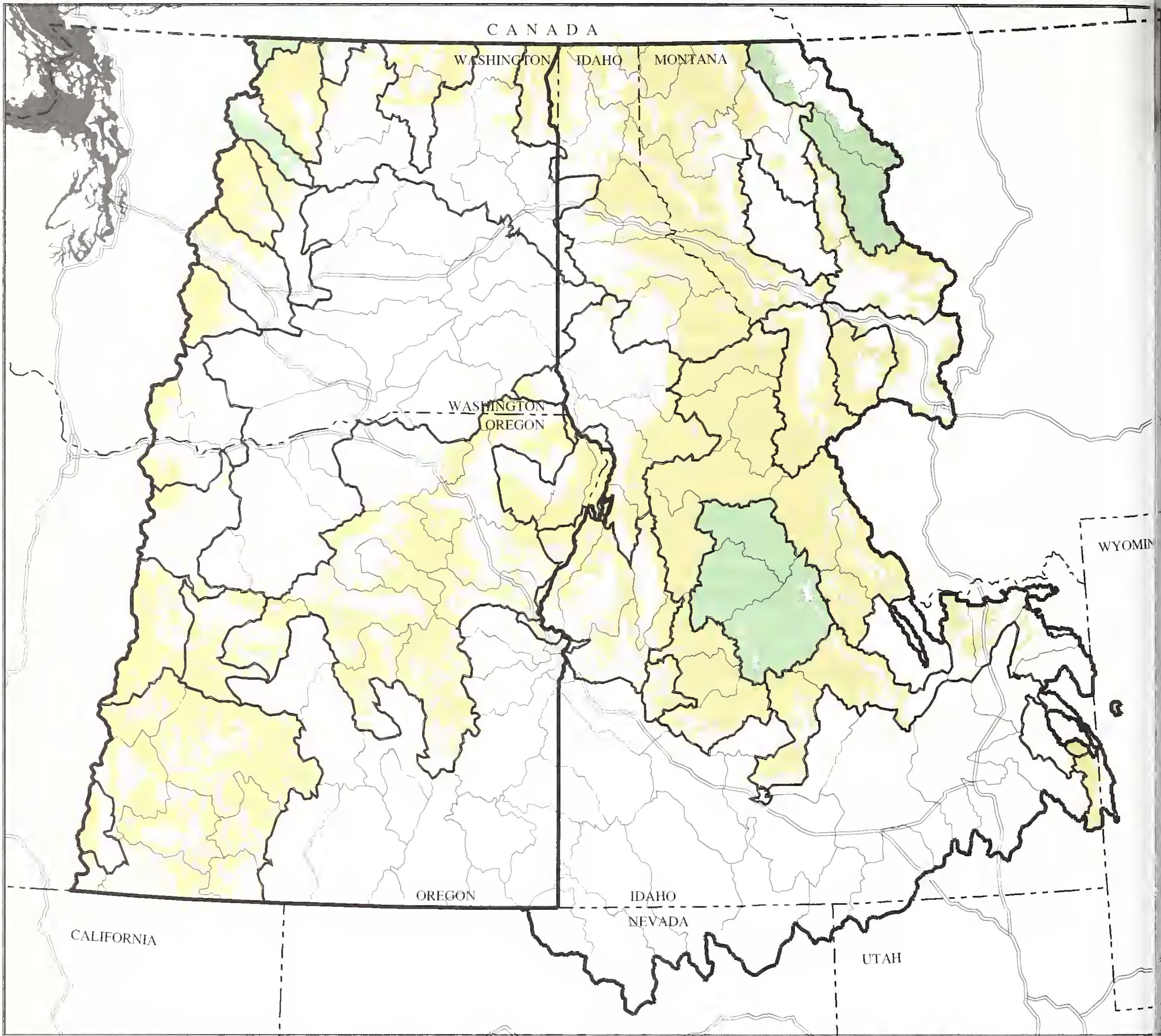
Table 3-2. Desired Seral Stages at the Landscape Level for Alternative 4

PVG	Early	Mid	Mature[1] and Old[2] Multi	Mature & Old Single	Other[3]
Distribution (percentage of PVG)					
Dry	10-20	30-40	10-20	20-30	0-15
Moist	20-35	40-50	15-25	5-10	
Cold	20-30	45-55	10-20	5-15	1-2
Shade-Intolerant Species (percentage of seral stages)					
Dry	70-80	65-75	60-75	85-95	
Moist	65-80	60-70	60-70	65-80	
Cold	60-70	50-60	45-55	75-85	

[1] Mature refers to ages and sizes of dominant trees that are at least at culmination of mean annual increment of tree stand volume growth.
[2] Old refers to ages and sizes of dominant trees that are significantly beyond what may be found at culmination of mean annual increment of tree stand volume growth.
[3] Refers to understory of grasses, shrubs, and forbs.

Forest Wildlife Habitat

The needs of forest-dependent wildlife species are met by the structure and composition, ecological processes, and ecosystem functions. Habitats ensure long-term evolutionary potential of native species. Habitat attributes of old forests are abundant. Habitats of endemics, disjunct species, and centers of biodiversity of rare plant and animal species are being managed to meet these species needs. Natural Areas with

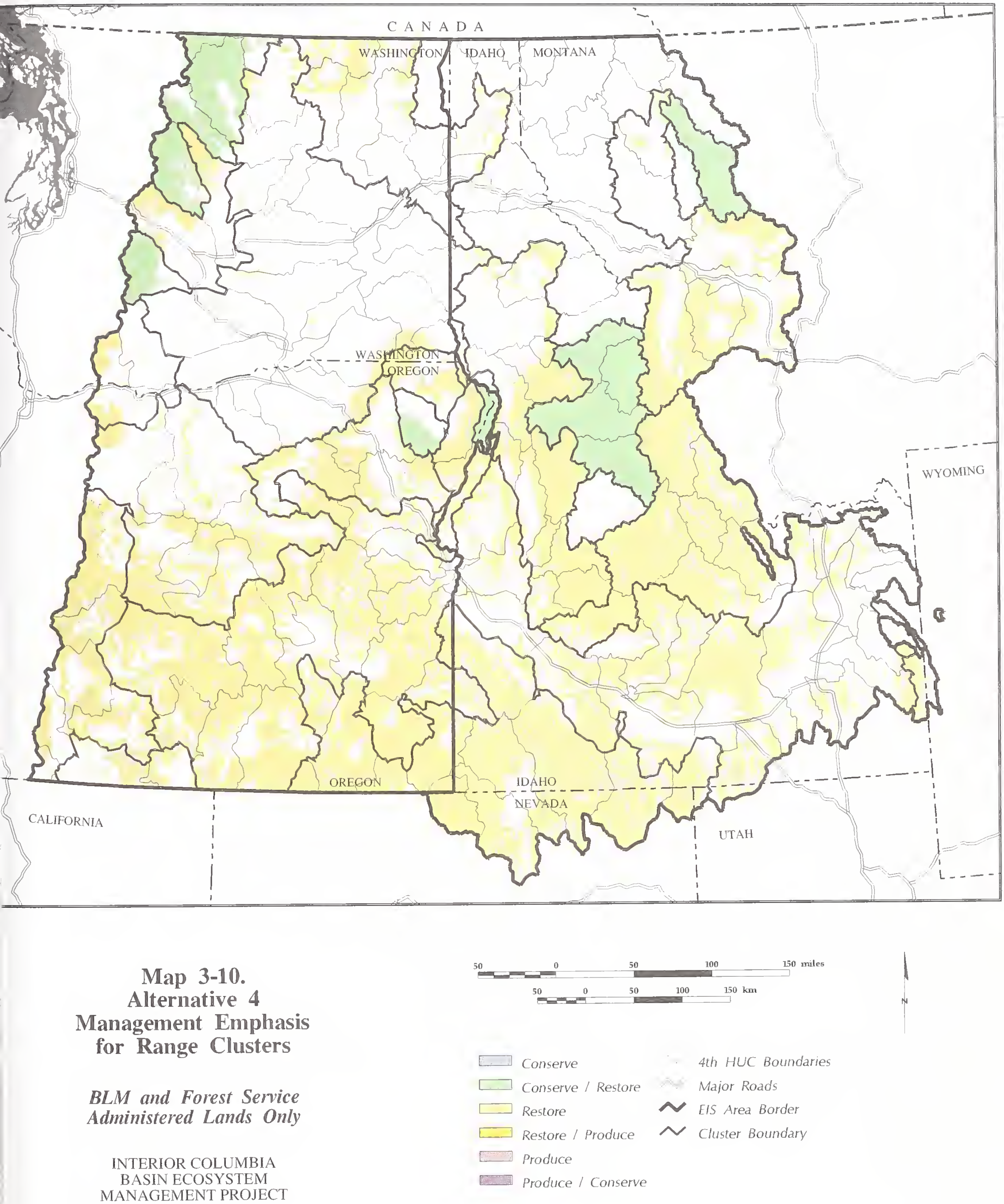


Map 3-9.
Alternative 4
Management Emphasis for Forest Clusters

BLM and Forest Service Administered Lands Only

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Project Area
1996

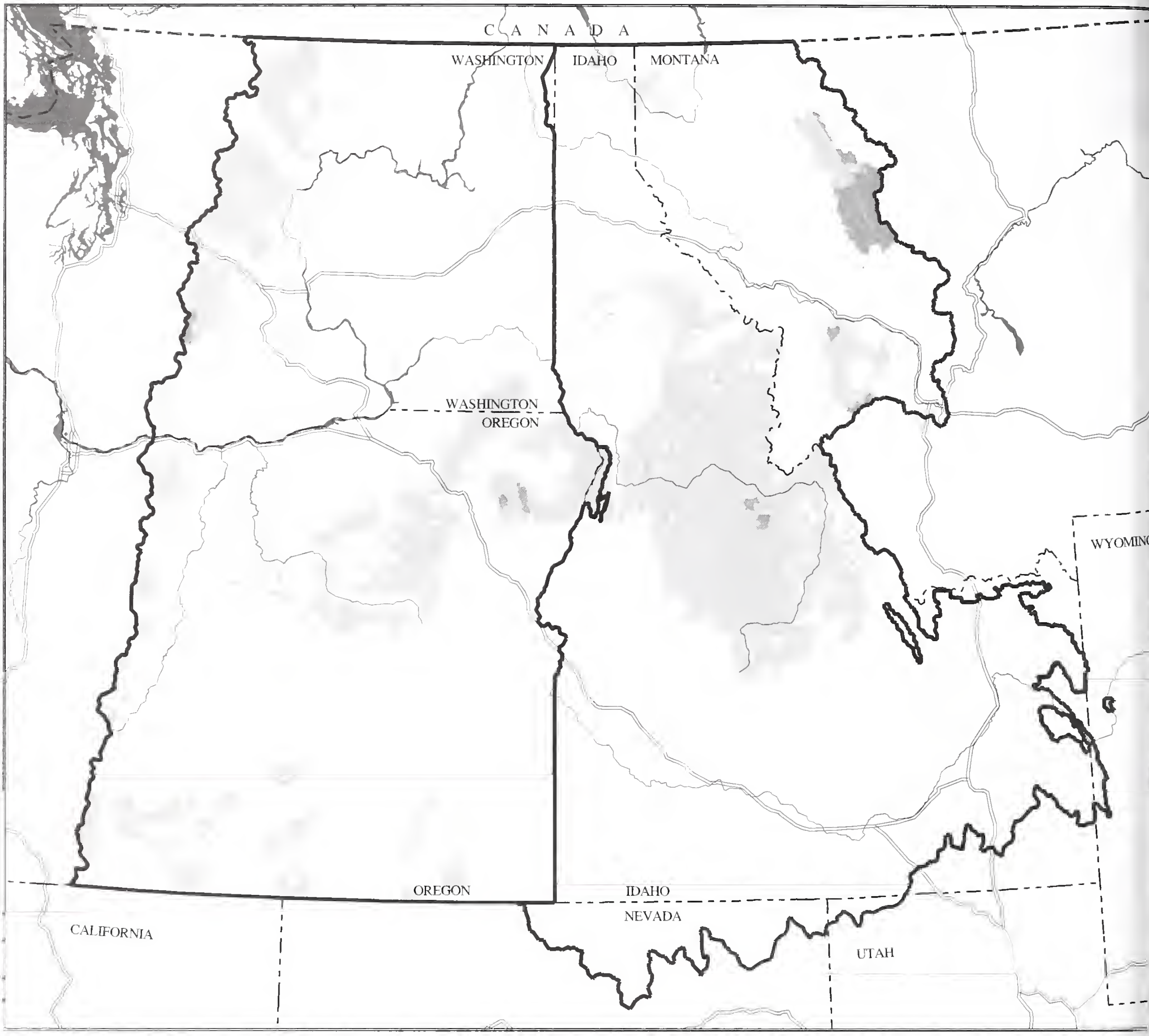


Map 3-10.
Alternative 4
Management Emphasis for Range Clusters

BLM and Forest Service Administered Lands Only

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

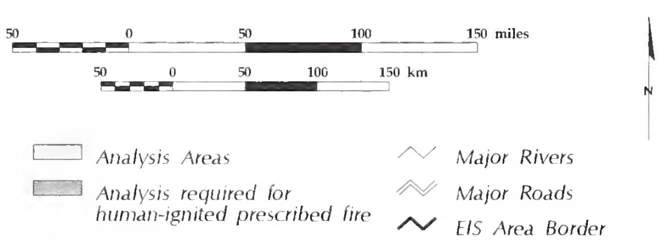
Project Area
1996



Map 3-11.
Alternative 4
Potential Areas for Ecosystem Analysis at the Watershed Scale

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996



Ecosystem Analysis at the Watershed Scale is required before management activities in Category 1 sub-basins or prior to management activities that would affect federally listed and proposed species (not mapped) or recently occupied or currently accessible habitat of federally listed and proposed fish species.

high species endemism or biodiversity are common and contribute to viable populations and the delisting of threatened or endangered species. Habitats prevent the need for listing of species given special consideration by land management agencies. Management is designed to increase amounts and distribution of habitat attributes where needed to be sufficient to meet the needs of endemic species and species with the largest home range requirements. Blocks of old forest habitats are large and well connected with areas of similar forest types. Habitat maintains options for evolutionary processes at the edge of all species ranges. Human activities are at levels that allow most species to maintain a desired distribution in forested environments. In the long term, management activities are dispersed and infrequent; in the short term, management activities are common. In many forest areas, many roads are closed (seasonal or permanent), or located to achieve the desired wildlife habitat conditions.

Terrestrial Ecosystems~Rangelands

Rangelands reflect a mosaic of multiple-aged shrubs, forbs, and native grasses with management emphasis on maintaining a diverse native plant community. Most seedings have been diversified by the addition of various native grasses, forbs, and shrubs, and have been converted to native plants where desirable. New infestations of noxious weeds are not common across the landscape and existing large infestations are slowly declining.

Western juniper-dominated sites are rare across the rangelands. The exception to this is rock outcrops, ridges, mesas, or other areas not prone to fire, which typically have shallow soils with little accumulation of fine fuels. Some areas have diverse plant communities with low densities of western juniper as well as a full complement of native understory shrubs, grasses, and forbs. Conifers are not dominating rangeland areas such as dry grassland.

Prescribed burning and prescribed natural fire have maintained the diverse, mosaic shrub steppe plant communities as well as the grassland communities that are subject to conifer encroachment. Most of the altered sagebrush steppe consists of diverse perennial plant communities, with the grass components dominated by both native and exotic perennial grasses. Greenstripping and other fire breaks are still apparent along roads and along the remaining altered sagebrush steppe boundaries.

Dry Grass Potential Vegetation Group. Sixty to 80 percent of the area is dominated by native grasses and forbs without conifer and shrub encroachment.

Dry Shrub Potential Vegetation Group. Fifty to 70 percent of the area in this group is dominated by native grasses and forbs with an overstory layer of shrubs. Ten to 25 percent of the area is dominated by native grass and forb communities. The remaining area is dominated by closed shrub communities with declining herbaceous layers, by seedings of exotic and native grasses and other plants, and in a small area by annual grasses and noxious weeds.

Cool Shrub Potential Vegetation Group. Sixty to 80 percent of the area in this group is dominated by native grasses and forbs with an overstory layer of shrubs. Fifteen to 40 percent of the area contains mixtures of perennial grasses and forbs. Closed canopy sagebrush and conifers dominate the remaining area.

Rangeland Wildlife Habitat

Rangelands have the necessary structure and composition, ecological processes, and ecosystem function to meet most needs of Federal and State listed and sensitive rangeland-dependent wildlife species. The distribution of different amounts and ages of shrubs, grassland, and woodland are approaching desired levels in a mosaic pattern. Rehabilitation or restoration of native shrub communities are accomplished where site potential permits to enhance wildlife habitat. Natural areas and areas of high species endemism or biodiversity are common and contribute to viable populations, but gains in viable populations are moderate. Vegetation is appropriate for the site with multiple age classes of shrubs and grass being common. These habitats are becoming less fragmented and more connected due to increasing abundance of native vegetation. Areas are large and connected with other areas of similar vegetation to maintain species distribution and densities that are closely associated with rangeland habitats. Human activities are at a level that allows species to maintain expected distribution, but some species densities may be low due to human activities. In many areas roads are closed or located to reduce habitat fragmentation and

reduce human disturbance; road densities are low in many areas. Blocks of similar habitats are large and connect with areas of similar vegetation. In many areas roads are closed (seasonally or permanently) or located to achieve the desired wildlife habitat conditions.

Aquatic Ecosystems

Watershed Processes

Riparian areas are resilient, diverse, and functioning within their site potential. Riparian areas in proper functioning condition are managed to maintain at least that condition with no downward trends, and there is an annual increase in the number of areas functioning at risk that show an upward trend toward proper functioning condition. Less resilient and more sensitive areas are recovering. Tall trees, moderate or large in diameter, within riparian areas are fairly frequent. Riparian areas are covered by protective vegetation and generally connected with their streams and upslopes.

Most soils have protective cover, adequate levels of soil organic matter, and coarse woody material distributed in varying sizes and types. Soils also have adequate physical properties for vegetation growth and hydrologic function. Physical, chemical, and biological processes in all soils function similarly to soils that have not been harmfully disturbed.

Roads in riparian areas are few and stable. Roads exist in riparian areas only under the following circumstances: where needed for major public transportation thoroughfares, where they do not cause problems to aquatic and riparian resources, or where there are no other practical alternatives. Some road corridors from new roads are apparent, but roads in sensitive landscapes are few and stable. There is moderate-to-strong evidence of human management activity across the landscape.

Aquatic Species Habitat

Restoration strategies are implemented on nearly all high risk sites within category 2 and portions of category 3 sub-basins, promoting recovery of watershed, riparian, water quality, and aquatic conditions characteristic for that geoclimatic setting. Improved aquatic habitat conditions allow threatened and endangered aquatic species populations to stabilize and expand into previously occupied habitat. Native aquatic species population's strongholds are increasing across the project area. Major river corridor conditions allow most aquatic species to achieve their full life cycles.

The following desired range of future conditions applies to Forest Service- or BLM-administered lands:

- ◆ Water quality provides for stable and productive riparian and aquatic ecosystems;
- ◆ Sediment regimes that are appropriate to geoclimatic setting. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport;
- ◆ Hydrologic regimes in streams, lakes, and wetlands appropriate to the geoclimatic setting. Important elements of the hydrologic regime include those processes necessary to sustain proper channel form and riparian, aquatic, and wetland habitats and to allow proper patterns of sediment, nutrient, and wood routing. This includes the timing, magnitude, duration, and spatial distribution of peak, high, and low flows;
- ◆ Instream flows to support healthy riparian and aquatic habitats, the stability and effective function of stream channels, and the ability to route flood discharges;
- ◆ Natural timing and variability of the water table elevation in meadows and wetland;
- ◆ Diversity and productivity of native and desired non-native plant communities in riparian zones;
- ◆ Riparian vegetation to: (a) provide an amount and distribution of large woody debris characteristic of natural aquatic and riparian ecosystems; (b) provide adequate summer and winter thermal regulation within the riparian and aquatic zones; (c) help achieve rates of surface erosion, bank erosion, and channel migration characteristic of those under which the communities developed;
- ◆ Riparian and aquatic habitats necessary to foster the unique genetic fish stocks that evolved within the specific geoclimatic region;
- ◆ Habitat supports viable populations of native plant, invertebrate, and vertebrate aquatic and riparian-dependent species, including threatened and endangered species, that are well distributed within their historical ranges;

- ◆Habitat supports harvestable populations of native aquatic and riparian-dependent species of commercial, cultural, and recreational significance;
- ◆Habitat supports desired recreational fishing opportunities for non-native species where they will not further erode native species status or prevent attainment of objectives for native species;
- ◆The distribution, diversity, and complexity of watershed and landscape-scale features are maintained and restored to ensure protection of the aquatic systems to which species populations and communities are uniquely adapted;
- ◆Spatial and temporal connectivity within and between watersheds are maintained and restored. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact strongholds. These connections will provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

Human Uses and Values

- ◆ Social and economic systems have adjusted (in some locations grown) to the changed amounts and product mix of commodity and non-commodity outputs. Enhanced forest, range, riparian, and aquatic ecosystems enable individuals and firms to obtain social and economic benefits from sustained levels of management projects and restoration actions;
- ◆ Local public needs and desires are reconciled with the Federal agencies' ecosystem restoration needs and opportunities; and
- ◆ Payments to local units of governments continue within an acceptable range based on local conditions and need for restoration.

Alternative 5

Theme

This alternative emphasizes production of goods and services at the subregional level consistent with the principles of ecosystem management. Biological capability and economic efficiency are used to determine relative priority uses for an area, rather than local demands and traditional uses. Areas that are best able to produce products, goods or services, or desired conditions are targeted to do so within the ecological capability of the area. Other uses also are expected to exist when they do not conflict with or diminish the priority uses. While a full range of conditions, products, and services may not be provided in all localities, the desired range of conditions, products, and services will be met on a regional (project area) basis. Direct involvement with other federal agencies, and

Alternative 5 - Management Emphasis Within Forest and Range Clusters for the Project Area

	Forest Cluster % of Forest Cluster	Forest Cluster Cluster No.	Range Cluster % of Range Cluster	Range Cluster Cluster No.	Forest Cluster	Range Cluster
Management Emphasis					**Management Priority**	
Conserve	10	1	7	2	Recreation/Aquatics	Recreation/Aquatics
Conserve/Restore	15	2	25	3	Aquatics/Recreation	Recreation/Wildlife
Restore	39	3, 5	NA	NA	Aquatics/Timber/ Livestock	NA
Restore/Produce	18	6	35	1, 6	Wildlife/Recreation	Livestock/Timber/ Wildlife
Produce	18	4	NA	NA	Timber/Wildlife	NA
Produce/conserve	NA	NA	33	4, 5	NA	Wildlife/Livestock/ Recreation

State, county, and tribal governments will be used in planning, decision-making, and implementation of programs.

In this alternative, both EIS teams (UCRB and Eastside) identified areas across the project area best able to produce products, goods, services, or desired conditions, within the ecological capability of the land. Five major priority areas were considered: timber, livestock, aquatic resources, wildlife, and recreation. The assumption used in building this alternative was that each forest and range cluster has a primary priority and some have a secondary priority. Other uses are likely to occur, but any conflicts would be resolved in favor of the priority uses of the area.

What is the Design of Alternative 5?

Because of the unique approach undertaken in Alternative 5, each forest and range cluster has both management emphasis (see maps 3-12 and 3-13) and management priority (see maps 3-14 and 3-15).

Activity tables (tables 3-6 and 3-7) are presented for each forest and range cluster by alternative to aid in analysis of effects and for projection of outcomes if Alternative 5 were selected.

As seen in the table below, forest clusters 1 and 2 and range clusters 2 and 3 promote Conserve strategies and recreation and/or aquatic resource management emphasis. Generally under these approaches, disturbance is allowed to play a more natural role in maintaining or achieving ecological integrity. Under the Conserve strategy, the level of management activity is generally low, except moderate levels of watershed restoration and use of prescribed fire. Prescribed fire is the primary tool in maintaining appropriate vegetative conditions for the given environment.

Most of the other clusters focus on production and/or restoration, often with a timber and/or livestock grazing priority. Where timber and livestock production are a primary priority, natural large-scale disturbances will be prevented to protect high resource values. The approach emphasizes reduced fire hazards, particularly in the wildland/urban interface.

On areas with wildlife, aquatics, and recreation as a primary priority (forest clusters 1, 2, 3 and 6), the intent is to protect, maintain and/or restore habitats for native and non-native animals and plants and for ecological processes and functions.

On forest clusters where timber and livestock production receive priority, habitat is designed (similar to Alternative 3) and activities mitigated to maintain minimum habitat components for viable populations. Where wildlife is a secondary priority, habitat components may be maintained above those necessary for minimum viable populations.

In the timber and/or livestock priority areas, the basic aquatic strategy is to conserve remaining fish strongholds and high quality habitat and water, while producing high output levels of timber and forage. Map 3-16 shows areas under Alternative 5 where ecosystem analysis is potentially required as part of the aquatic strategy.

Desired Range of Future Conditions

In addition to the desired range of future conditions elements common to all action alternatives, the following is the vision of the long-term (50 to 100 years) condition of the land under Alternative 5:

Terrestrial Ecosystems~Forestlands

Dry Forest Potential Vegetation Group.
In the dry forest potential vegetation groups, early successional stages and disturbance processes are maintained through vegetation management, endemic insect and disease disturbances, and fire.

There are either large patches dominated by young forest and mature and old multi-story forests within timber priority areas, or a mosaic of age classes composed of ponderosa pine and Douglas-fir in other priority areas (table 3-3).

Moist Forest Potential Vegetation Group.
In the moist forest potential vegetation groups, early successional stages and disturbance processes are maintained through intensive vegetation management, endemic insect and disease disturbances, windthrow often aided by root rot, and fire.

There are either large patches of young forest and mature and old multi-story forest within timber priority areas, or a mosaic of age classes

in the other priority areas (table 3-3). Early successional western white pine dominates the young forest structural stage.

Cold Forest Potential Vegetation Group. In the cold forest potential vegetation groups, early successional stages and disturbance processes are maintained through endemic and epidemic insect and disease disturbances, and minimal vegetation management.

There is a high abundance and persistence of mature and old forest dominated by lodgepole pine and Douglas-fir in the multi-story structural stage. The young forest stages have a moderate component of early successional whitebark pine and Engelmann spruce/ subalpine fir. Stands are well distributed in a mosaic of age classes (table 3-3).

In dry and moist forest potential vegetation groups outside the rural/wildland interface, where there is an emphasis to manage for timber production, underburns and/or thinning is used to minimize stand-replacing and mixed severity wildfires. The fire regime can be lengthened in young forests to allow establishment of fully stocked stands with moderate crown closure. In cold potential vegetation groups, underburns and/or thinning can be used to produce moderate to large diameter trees.

The forested potential vegetation groups have an overall range of structural stages at the landscape level as seen in table 3-3.

Table 3-3. Desired Seral Stages at the Landscape Level for Alternative 5

PVG	Early	Mid	Mature[1] and Old[2] Multi	Mature & Old Single	Other[3]
Distribution (percentage of PVG)					
Dry (W)	10-25	35-45	15-25	10-20	0-15
Dry (O)	15-25	30-45	10-20	10-30	
Moist (W)	20-30	45-60	10-25	2-7	
Moist (O)	20-30	45-60	10-20	5-10	
Cold (W)	25-35	40-50	10-20	5-15	1-2
Cold (O)	25-35	40-50	10-20	5-15	
Shade-Intolerant Species (percentage of seral stages)					
Dry (W)	80-90	65-75	65-75	75-90	
Dry (O)	70-80	60-70	55-70	75-90	
Moist (W)	65-80	60-70	60-70	55-70	
Moist (O)	65-75	55-65	50-60	55-70	
Cold (W)	55-65	50-60	55-65	90-100	
Cold (O)	55-65	50-60	50-60	85-95	

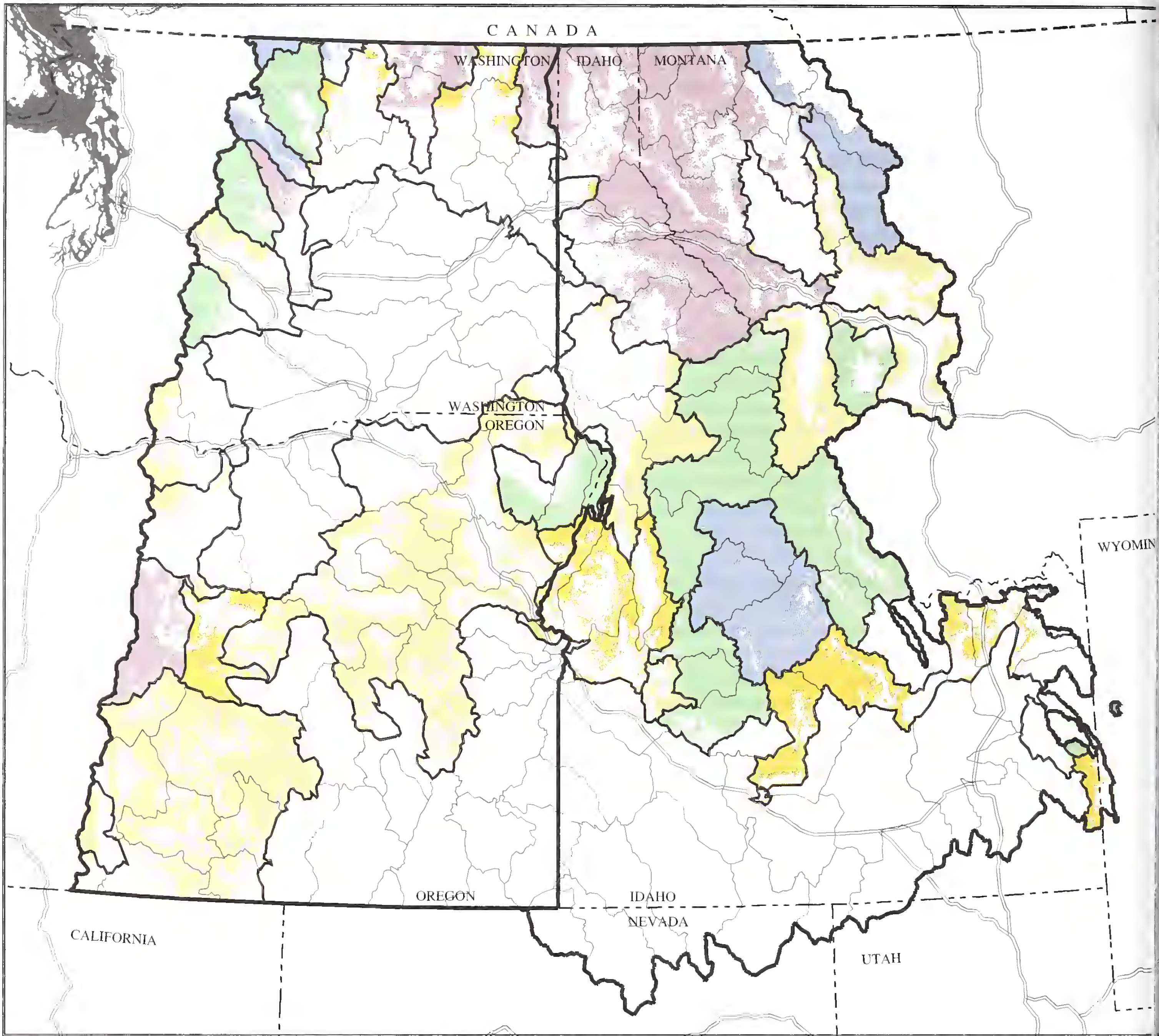
[1] Mature refers to ages and sizes of dominant trees that are at least at culmination of mean annual increment of tree stand volume growth.
[2] Old refers to ages and sizes of dominant trees that are significantly beyond what may be found at culmination of mean annual increment of tree stand volume growth.
[3] Refers to understory of grasses, shrubs, and forbs.

(W) = within timber priority areas;
(O) = outside of timber priority areas.

Forest Wildlife Habitat

Forested *wildlife priority areas* have the necessary forest structure and composition, ecological processes, and ecosystem function to meet the needs of *all species* associated with forest communities. Areas of habitat are extensive and maintained to assure species distribution and densities associated with forest habitats. Habitats ensure long-term evolutionary potential of native species. Forested land contains habitat attributes of old forests which connect with areas of similar vegetation. Habitats are managed to prevent listing of species given special consideration by land management agencies. Habitats of endemics, disjunct species, and rare plant and animal species and centers of biodiversity are being managed to meet these species needs. Human activities are at levels that allow sufficient useable habitat for most species to be represented and well distributed in forested environments. Habitat maintains options for evolutionary processes at the edge of species ranges. Management activities occur primarily in areas of major disturbances. Roads are few.

In forest potential vegetation groups, *other priority areas* have the necessary forest structure and composition, ecological processes, and ecosystem function to meet the needs of *most* forest-dependent wildlife species, but species densities are low. Forested land contains habitat attributes of old forests which are mostly connected with areas of similar vegetation. Human activities are at levels that allow most species to maintain a desired distribution in forested environments. Management activities occur primarily in areas of major disturbances.



Map 3-12. Alternative 5 Management Emphasis for Forest Clusters

BLM and Forest Service Administered Lands Only

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996

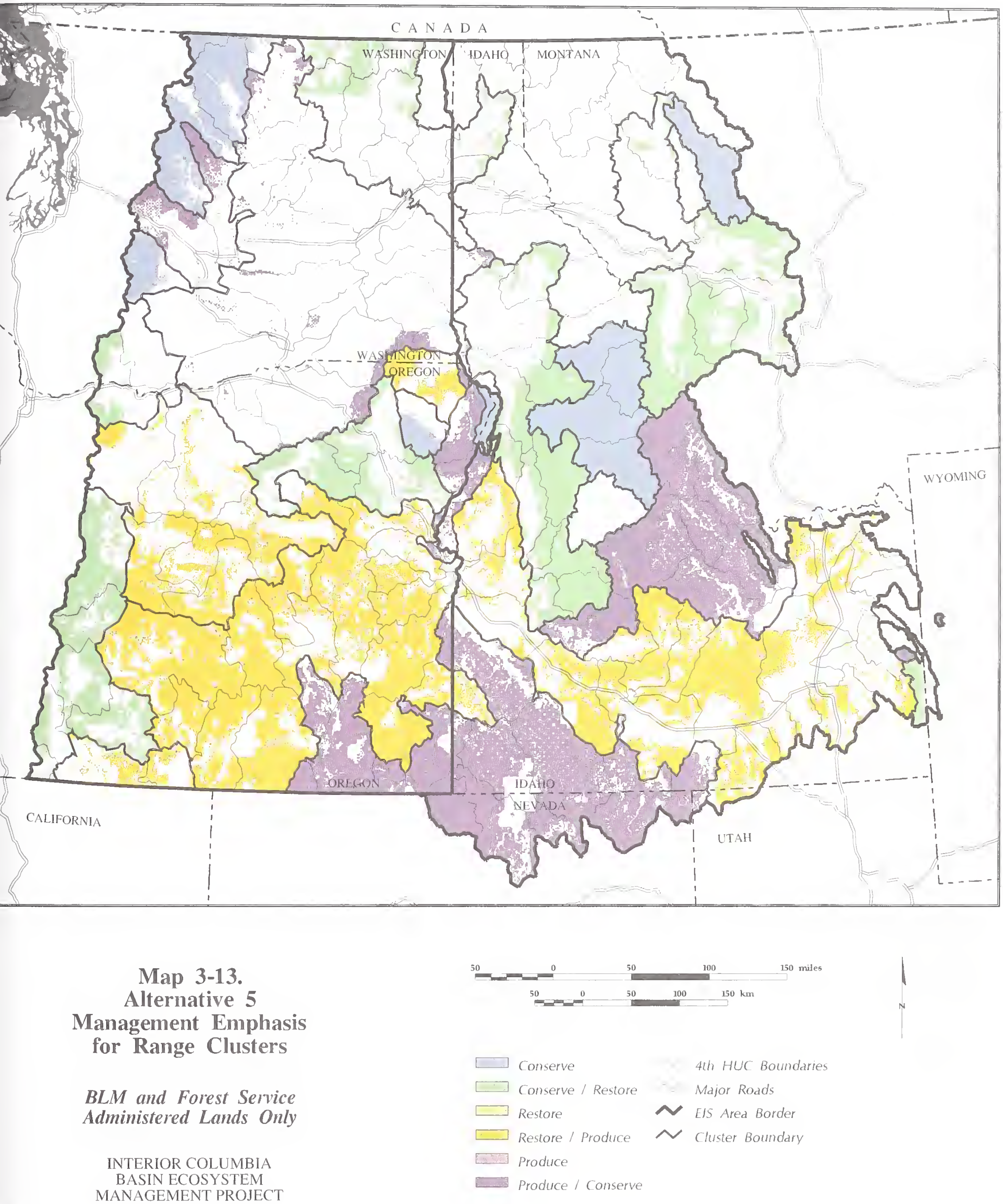
50 0 50 100 150 miles

50 0 50 100 150 km

N

Conserve
Conserve / Restore
Restore
Restore / Produce
Produce
Produce / Conserve

4th HUC Boundaries
Major Roads
EIS Area Border
Cluster Boundary

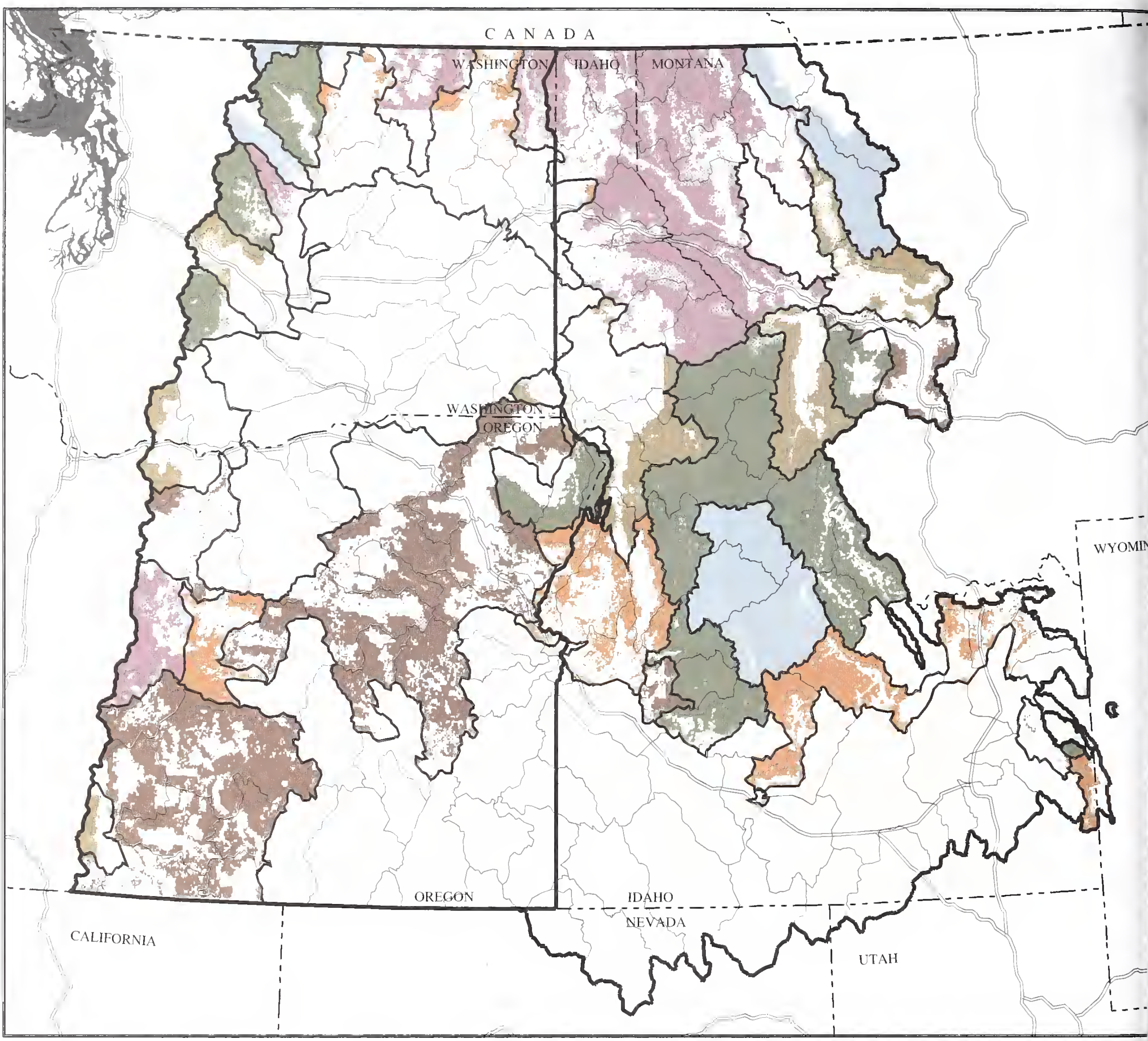


Map 3-13. Alternative 5 Management Emphasis for Range Clusters

BLM and Forest Service Administered Lands Only

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Project Area
1996



Map 3-14. Alternative 5 Primary and Secondary Priorities by Forest Cluster

BLM and Forest Service Administered Lands Only

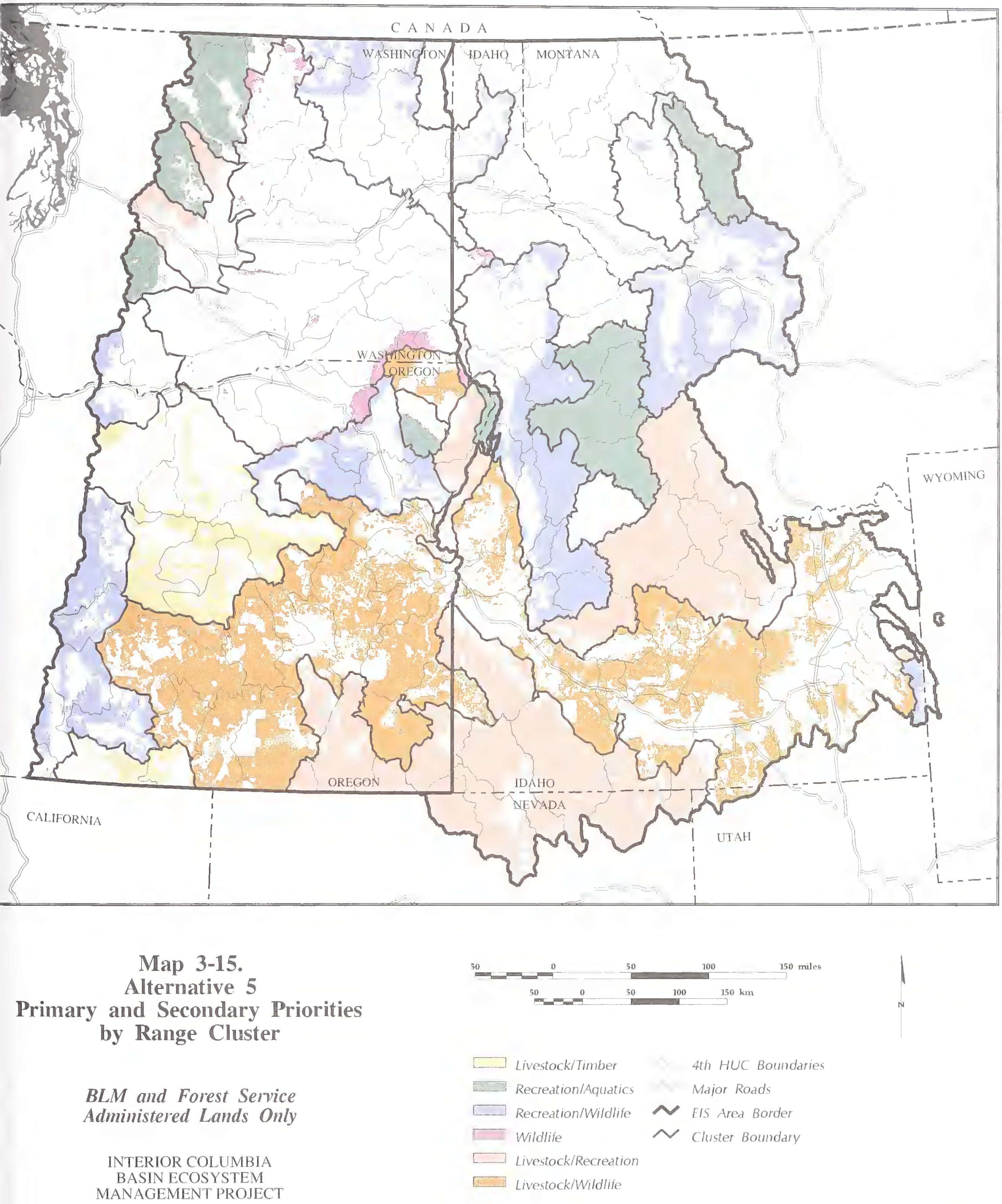
INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Project Area
1996

50 0 50 100 150 miles
50 0 50 100 150 km

N

- Primitive Recreation/Aquatics
- Aquatics/Recreation
- Aquatics/Timber
- Timber/Wildlife
- Timber/Livestock
- Wildlife/Recreation
- 4th HUC Boundaries
- Major Roads
- EIS Area Border
- Cluster Boundary

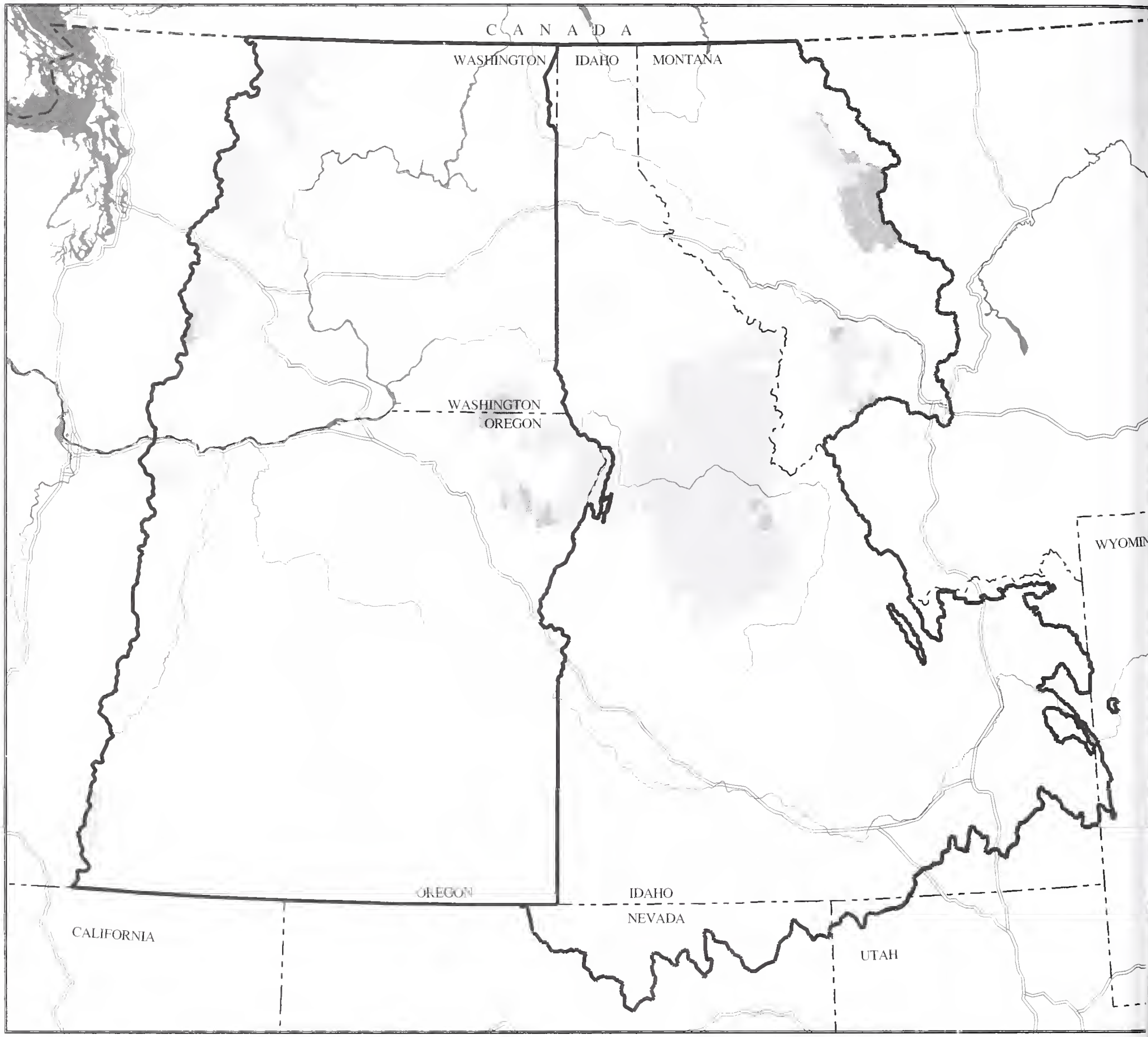


Map 3-15. Alternative 5 Primary and Secondary Priorities by Range Cluster

BLM and Forest Service Administered Lands Only

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Project Area
1996



Map 3-16.
Alternative 5
Potential Areas for Ecosystem Analysis at the Watershed Scale

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996

50 0 50 100 150 miles

50 0 50 100 150 km

N

Analysis Areas

Analysis required for human-ignited prescribed fire

Major Rivers

Major Roads

EIS Area Border

Ecosystem Analysis at the Watershed Scale is required in areas outside of timber and livestock priority areas before management activities in Category 1 sub-basins or prior to management activities that would affect federally listed and proposed species (not mapped) or recently occupied or currently accessible habitat of federally listed and proposed fish species.

Terrestrial Ecosystems ~ Rangelands

Within Livestock Priority Areas. Rangelands reflect a mosaic of multiple-aged shrubs, forbs, and native and exotic perennial grasses. There is a management emphasis on maintaining a grass-dominated plant community in the shrubland types for livestock production. Forbs and shrubs are a minor, but significant, part of the plant community. Most seedings have been diversified by the addition of various forb and shrub forage species. New infestations of noxious weeds are not common across the landscape, and existing large infestations are slowly declining.

Western-juniper-dominated sites are rare across the rangelands. The exception is rock outcrops, ridges, mesas, or other sites not prone to fire which typically have shallow soil areas with little accumulation of fine fuels. Conifers are not dominating rangeland areas such as dry grasslands.

Prescribed burning and prescribed natural fire have maintained the more grass-dominated communities although the burning is not continuous and is prescribed as mosaic. Altered sagebrush steppe has been converted to diverse perennial plant communities that provide forage production. Greenstripping and other fire breaks are apparent along roads and along the altered sagebrush steppe boundaries.

Outside Livestock Priority Areas. Same as Alternative 4 for the general description. The specific description by Potential Vegetation Groups is described below.

Potential Vegetation Groups Within and Outside Livestock Priority Areas

Dry Grass Potential Vegetation Group. Seventy to 90 percent of the area within livestock priority areas, and up to 80 percent of the area outside livestock priority areas, are dominated by native grasses and forbs without conifer and shrub encroachment.

Dry Shrub Potential Vegetation Group. Thirty to 50 percent of the area in this group is dominated by native grasses and forbs with an overstory layer of shrubs. Twenty-five to 45 percent of the area within livestock priority areas is herbaceous-dominated. The remaining areas are dominated by desirable exotic and native plant seedings, annual grasses, or noxious weeds, and a small amount of closed shrub communities with declining herbaceous layers.

Cool Shrub Potential Vegetation Group. Forty to 60 percent of the area in this group is dominated by native grasses and forbs with an overstory layer of shrubs. Forty to 60 percent of the area within the livestock priority areas, and 10–25 percent of the area outside priority areas, contains mixtures of perennial grasses and forbs. Conifers are dominant on less than 5 percent of the area within the livestock priority area, and on less than 30 percent of the land outside livestock priority areas.

Rangeland Wildlife Habitat

Within rangelands, wildlife priority areas have the necessary structure and composition, ecological processes, and ecosystem function to meet the needs of Federal and State listed and sensitive rangeland-dependent wildlife species. The distribution of different amounts and ages of shrubs, grassland, and woodland is approaching desired levels in a mosaic pattern. Rehabilitation or restoration of native bunchgrass is accomplished where site potential permits. Management activities to control exotics are frequent and concentrated. Blocks of habitats are more connected with areas of similar vegetation. Human activities are at a level that allows most species to maintain a desired distribution. Roads are few.

Other priority areas in rangelands have the necessary structure and composition, ecological processes, and ecosystem functions to meet needs of all Federal and State listed and special status species dependent on rangeland habitat. Vegetation is appropriate for the site, with multiple age classes of shrubs and grasses being common. Rehabilitation or restoration of native shrub and grass communities has been accomplished. Management activities to control exotic plants are frequent. These habitats are becoming less fragmented and more connected due to increasing abundance of native vegetation. Areas are fairly well connected with other areas of similar vegetation to maintain species distribution and densities. Human activities are at a level that allows sufficient useable habitat for most species to be represented and maintain expected distribution, but some species densities may be low. In many areas roads are closed (seasonal or permanent) or relocated to increase habitat quality by reducing human disturbance; road densities are variable.

Aquatic Ecosystems

Watershed Processes

The desired range of future conditions for riparian areas, streams, lakes, soil, and road corridors in aquatic priority areas, is similar to the desired range of future conditions of Alternatives 4 and 6.

There is no downward trend in riparian condition and function in timber priority areas. Small to large sized trees provide watershed protection. Most riparian areas are covered with vegetation. Most areas are connected to their streams and upslopes but a few (the more sensitive and less responsive areas) are fragmented and isolated. Most streams are moderate in productivity and have habitat that is diverse and complex. Structure is provided by small diameter wood in the smaller streams. Large and dcep pools in the larger lower gradient streams are apparent.

Most portions of the landscape in timber priority areas have protective soil cover, organic matter, and coarse woody material; most biomass is stored in small to large diameter trees and as litter. Vegetation growth and hydrologic function are not impaired. There is some evidence of openings from old and new road corridors across the landscape. Moderate amounts of the landscape are open or partially open and next to the road corridors. Riparian vegetation does not appear separate and disconnected from upslope vegetation.

There is no downward trend in riparian condition and function in livestock priority areas. Most riparian areas are covered by vegetation. Most areas are connected to stream channel, floodplains, and subsurface flow networks. Woodlands are apparent. Most streams are moderate in productivity, and have habitat that is mostly complex and diverse. Structure is provided by vegetation and shrubs. Large deep pools in the larger lower gradient streams are apparent. Many streams are becoming narrow and deep.

Large portions of the landscape in livestock priority areas have protective soil cover and organic matter, mostly in the form of above-ground biomass and deep rooted plants. Soil and hydrologic function is not impaired.

Riparian areas in recreation priority areas are somewhat fragmented in areas of very concentrated and developed recreation. Small openings are infrequent. In dispersed use and undeveloped areas, riparian areas are resilient and functioning within conditions characteristic for that valley bottom setting and vegetation type. Streams are generally productive and somewhat diverse. Areas of concentrated or developed use have reinforced stream banks interspersed with vegetated and resilient stream banks. Structure is apparent; substrate tends to be of various sizes in both areas of concentrated and dispersed use. Habitat is fairly diverse and complex in concentrated use areas, and increasingly complex in areas of less use. Large deep pools are frequent.

New roads in some riparian areas within recreation priority areas are evident and stable, but overall roads in riparian areas are few. Old and new road corridors blend into the landscape as much as possible.

Aquatic Species Habitat

Restoration strategies have been implemented on nearly all high risk sites within aquatic and recreation priority areas, allowing recovery of watershed, riparian, water quality, and aquatic conditions characteristic for that geoclimatic setting. Improved aquatic habitat conditions allow threatened and endangered aquatic species populations to stabilize and expand into previously occupied habitat. Native aquatic species population strongholds are increasing basin-wide. Major river corridor conditions have improved to allow most species to achieve their complete life cycles.

The following desired range of future conditions applies to Forest Service- or BLM-administered lands:

- Water quality to a degree that provides for stable and productive riparian and aquatic ecosystems;
- Stream channel integrity, channel processes, and the sediment regime (including the elements of timing, volume, and character of sediment input and transport) under which the riparian and aquatic ecosystems developed;
- Instream flows to support healthy riparian and aquatic habitats, the stability and effective function of stream channels, and the ability to route flood discharges;

- Natural timing and variability of the water table elevation in meadows and wetlands;
- Diversity and productivity of native and desired non-native plant communities in riparian zones;
- Riparian vegetation to: (a) provide an amount and distribution of large woody debris characteristic of natural aquatic and riparian ecosystems; and (b) provide adequate summer and winter thermal regulation within the riparian and aquatic zones; (c) help achieve rates of surface erosion, bank erosion, and channel migration characteristic of those under which the communities developed;
- Riparian and aquatic habitats necessary to foster the unique genetic fish stocks that evolved within the specific geoclimatic region; and
- Habitat to support populations of well-distributed native and desired non-native plant, vertebrate, and invertebrate populations that contribute to the viability of riparian-dependent communities.

Human Uses and Values

- Social and economic systems have adjusted to changes in the location, amounts, and product mix of commodity and non-commodity outputs.
- Where land capability is more suited to support ecological values (such as endangered species), land allocations emphasize the economic and social values of protected biological resources, and economic and social systems have adjusted accordingly.

Alternative 6

Theme

This alternative emphasizes an adaptive management approach to restore and maintain ecosystems and provide for the social and economic needs of people. While much knowledge of natural resource management has been acquired through experience and research, ecosystems are complex, and knowledge of the functions and processes that make up ecosystems is limited. Management strategies would be adjusted based on information gained from continued research and monitoring of ecological, social, and economic conditions, and from direct input from other federal agencies, and State, county, and tribal governments.

This alternative is similar to Alternative 4 but takes a slower, more cautious approach. It implies the use of experimental processes, local research, and extensive monitoring, and is expected to take longer to reach desired conditions; there is built-in uncertainty concerning which management actions will prove to be the most effective. Restoration activities that are well studied and understood are pursued as actively under Alternative 6 as under Alternative 4.

Under this alternative, actions are implemented on a broad-scale basis when previous monitoring results or scientific research suggest that the actions are effective in achieving desired outcomes. Priorities for restoration are generally high hazard or high risk areas with high or moderate potential for success. The management direction under this alternative is similar to that of Alternative 4 except for the length of time expected, and except for the built-in uncertainty over which management actions will prove to be the most effective.

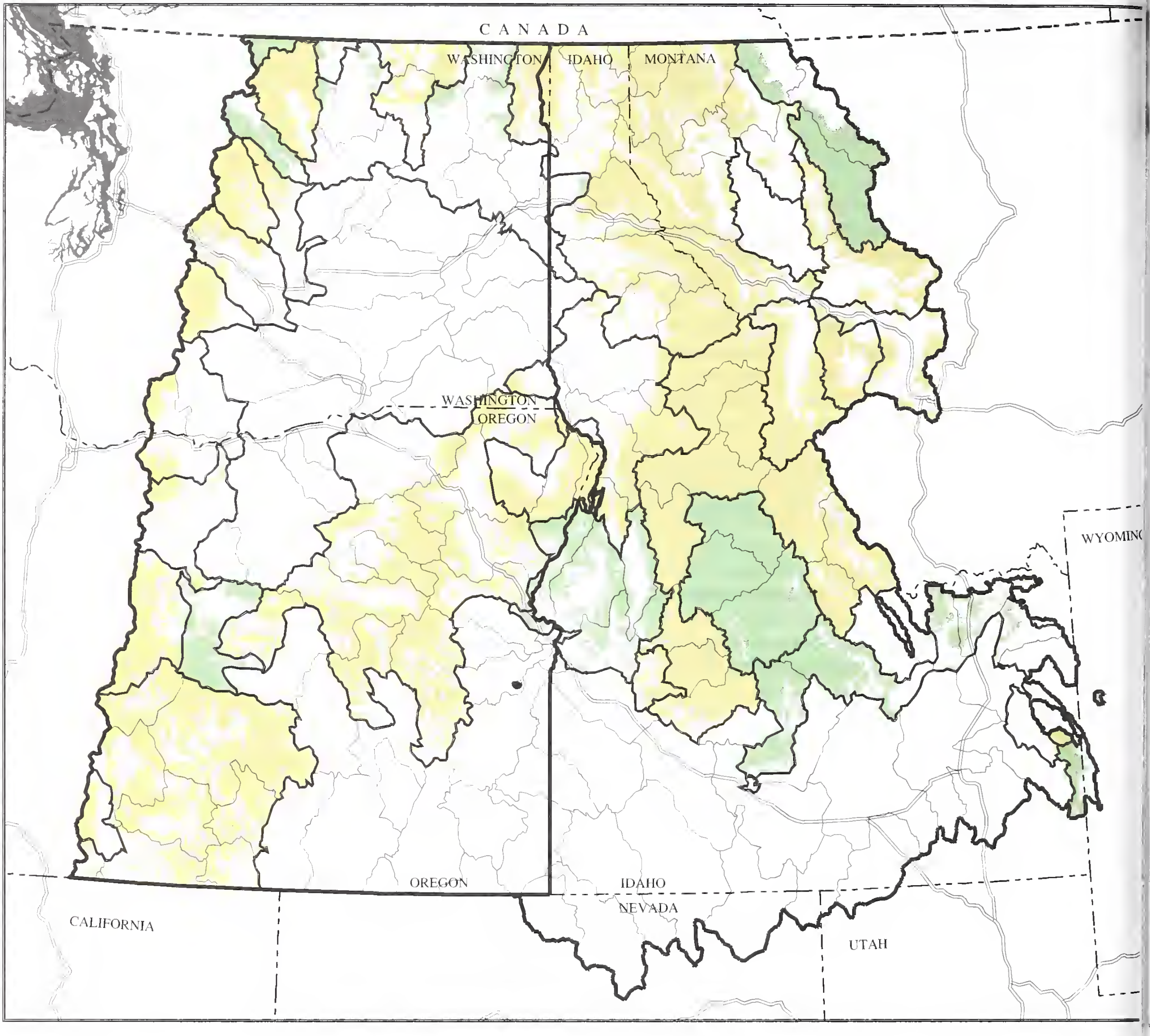
What is the Design of Alternative 6?

Alternative 6 employs more acres in the Conserve/Restore emphasis and less of a Restore emphasis than Alternative 4 for both forest and range clusters (see maps 3-17 and 3-18).

Activity tables (tables 3-6 and 3-7) are presented for each forest and range cluster by alternative to aid in analysis of effects and for projection of outcomes if Alternative 6 were selected.

Adjustments in strategic approaches and implementation are expected as a result of intensive application of the learning process. In some cases, restoration techniques and their effects are well known and would proceed on a pace similar to Alternative 4. See following table.

Within forests, restoration is emphasized at high levels for only forest cluster 5, all potential vegetation groups, and forest cluster 4, moist forest potential vegetation group. All other forest clusters have restoration planned at moderate



Map 3-17. Alternative 6 Management Emphasis for Forest Clusters

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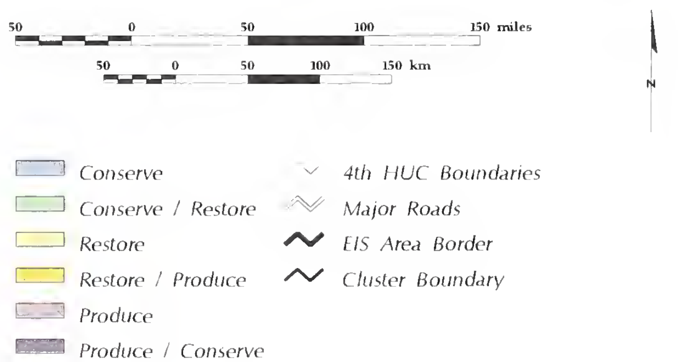
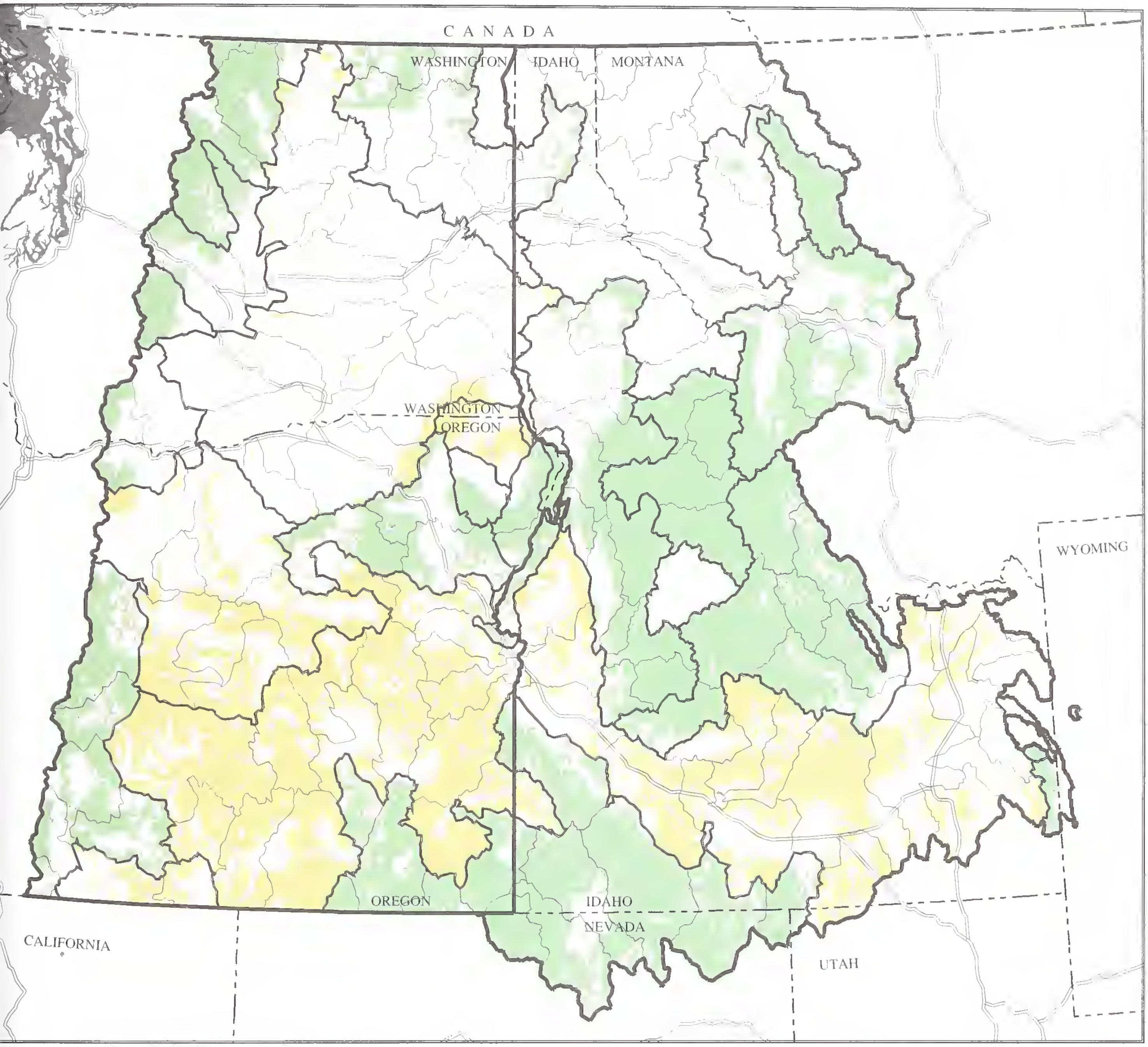
INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Project Area
1996





Map 3-18. Alternative 6 Management Emphasis for Range Clusters

BLM and Forest Service Administered Lands Only

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Project Area
1996

levels for the different groups. As in other alternatives, the intent of restoration is to achieve appropriate disturbance and successional processes and move forests toward desired conditions. The use of fire is generally the preferred approach in restoration of forest vegetation. Other resource activities are at levels similar to Alternative 4.

On rangelands, overall restoration of vegetation is generally at moderate levels in range clusters 1, 2, and 3, and moderate to low in all other clusters. Strategic direction for range clusters 4 and 6 also calls for improved rangelands. The approach is to restore degraded areas associated with more productive sites and begin the process of improving composition, increasing diversity, and achieving functional range processes.

Because of the more cautious approach, production activities are at lower levels. Timber harvest is expected at moderate levels in forest cluster 4 and relatively low levels in all other clusters. Restoration activities should also contribute toward producing additional outputs. Livestock management is anticipated at relatively moderate levels in range clusters 1, 4, and 6 and low levels in other clusters. As in other alternatives, some increased level of grazing may result from restoration and improved range conditions.

The overall approach to terrestrial conservation is also the same as Alternative 4. The intent is to restore and maintain a relatively moderate to high level of habitats and habitat features within desired ranges important for animals and plants.

The aquatic strategy for Alternative 6 (see Map 3-18a) is the same as Alternative 4 except Alternative 6 places greater emphasis on subbasin review and Ecosystem Analysis. The aquatic strategy focus is to conserve Category 1 subbasins, protect or restore habitats for federally listed, proposed, and candidate riparian-dependent or aquatic species, native trout fringe and stronghold habitats, and water quality to support beneficial uses, and protection, restoration, or maintenance of other riparian-dependent or aquatic species habitat to prevent future federal listing. This alternative has similar wateshed restoration levels as Alternative 4.

Watershed restoration is directed towards improving stream, riparian, soil, and upland integrity and function.

Desired Range of Future Conditions

In addition to the desired range of future conditions elements common to all action alternatives, Alternative 6 is portrayed by a desired range of future conditions that is similar to that of Alternative 4. Acknowledging that in the short term (less than 50 years), conditions are likely to look different under Alternative 6 than they do under Alternative 4, it is anticipated that in the long term, conditions would look similar to those described under Alternative 4. Therefore, for the desired range of future conditions specific to Alternative 6, see Alternative 4.

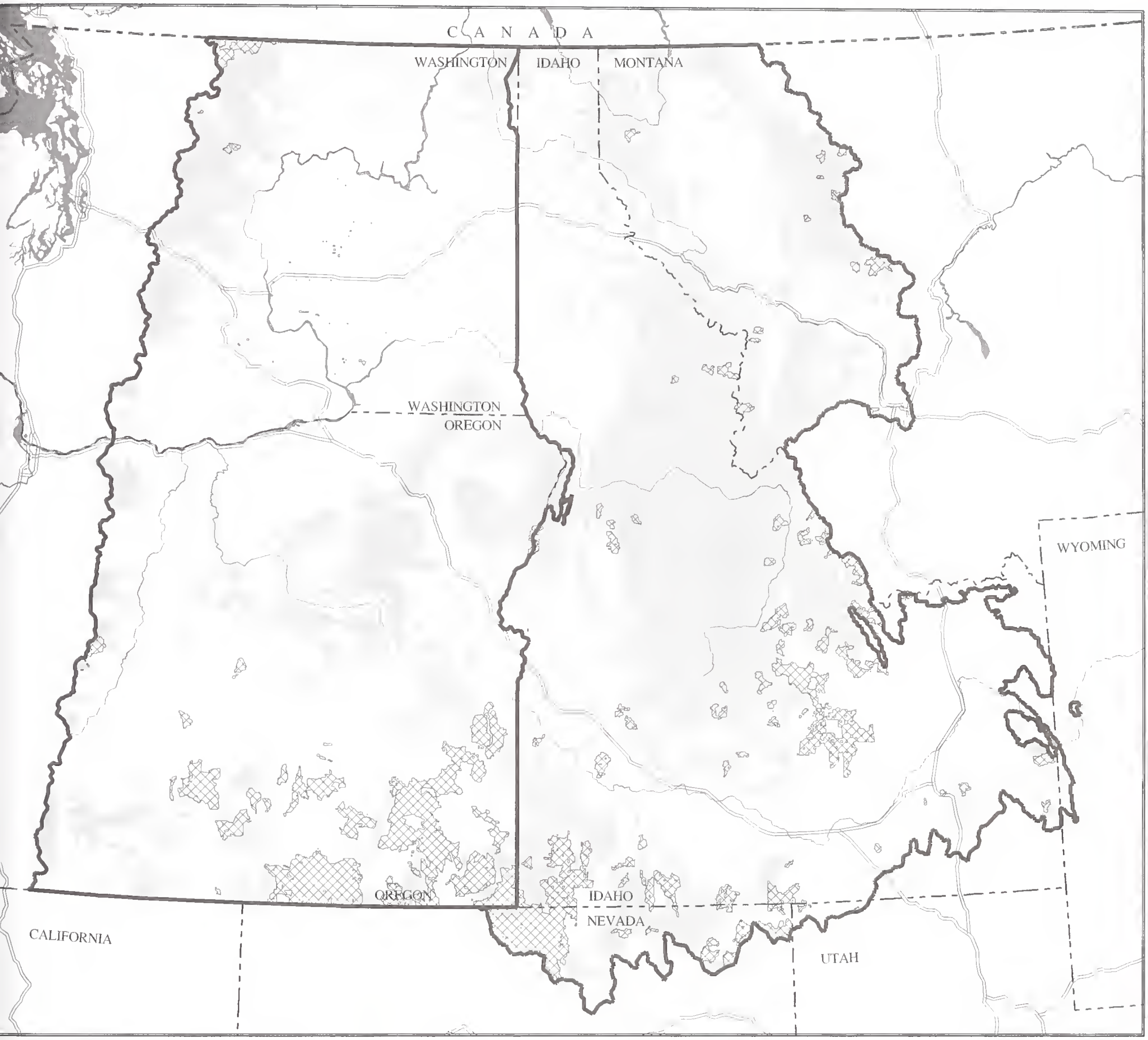
Alternative 7

Theme

This alternative emphasizes reducing short-term risk to ecological integrity and viable populations by establishing a system of reserves on lands administered by the Forest Service or BLM (see map 3-19). Reserves are delineated to include each of the representative vegetation types and

Alternative 6 - Percentage of Management Emphasis Within Forest and Range Clusters for the Project Area.

	Forest Cluster		Range Cluster	
	% of Forest Cluster	Cluster No.	% of Range Cluster	Cluster No.
Management Emphasis				
Conserve/Restore	28	1, 6	52	2, 3, 5
Restore	72	2, 3, 4, 5	48	1, 4, 6



Map 3-18a.
Alternative 6
otential Areas for Ecosystem Analysis at the Watershed Scale

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996

50 0 50 100 150 miles

50 0 50 100 150 km

N

Analysis Areas

Analysis required for human-ignited prescribed fire

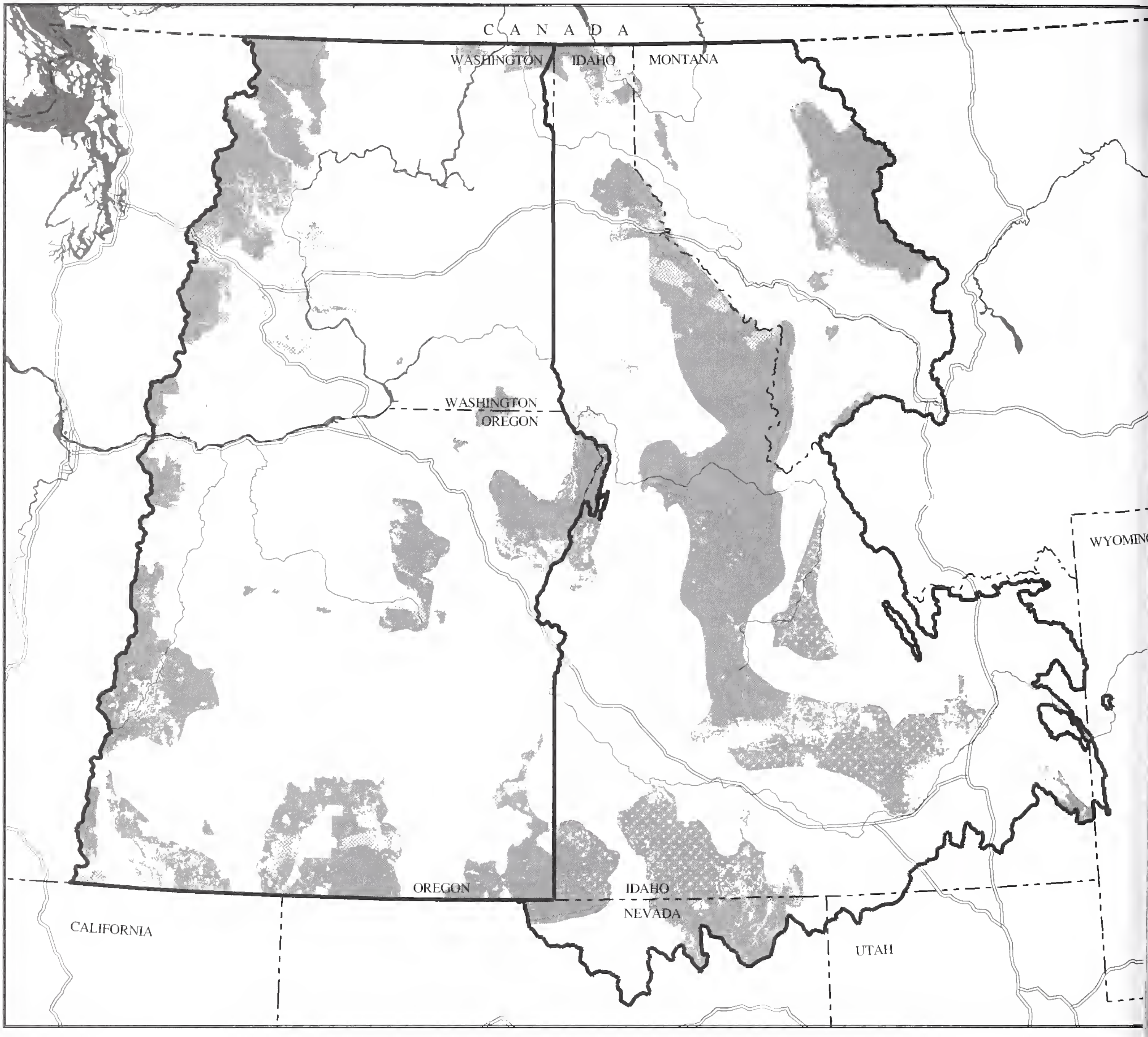
Predicted road density at < 0.7 mi/square mile

Major Rivers

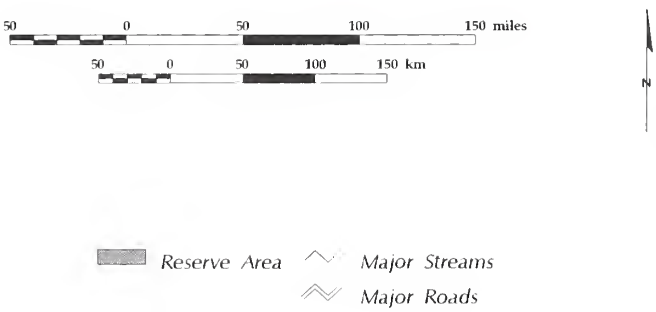
Major Roads

EIS Area Border

Ecosystem Analysis at the Watershed Scale is required before management activities in Category 1 sub-basins or prior to management activities that would affect federally listed and proposed species (not mapped) or recently occupied or currently accessible habitat of federally listed and proposed fish species or strongholds and fringe populations of redband trout, westslope cutthroat, or Yellowstone cutthroat trout. Also Ecosystem Analysis at the Watershed Scale is required prior to road density increases in subwatersheds that have road densities < 0.7 miles/square mile, or prior to management activities that affect large blocks of native rangeland (not mapped).



Map 3-19. Alternative 7 Preliminary Reserves



INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996

are large enough to contain the most likely disturbance events. The level of human use and management is very low within the reserves. Ecological disturbance events are expected to occur naturally within the reserves. When disturbance events (such as fire or disease) occur, actions are taken to reduce the likelihood of the event extending beyond the boundary of the reserve. Most restoration activities occur on lands managed by the Forest Service or BLM outside reserves, although restoration actions are taken within reserves where there is a high risk for events occurring in the short-term that would preclude achieving desired outcomes in the long term (for example, maintaining habitats for endangered or threatened species or other scarce habitats, or controlling erosion by rehabilitating roads). Management outside the reserve boundaries would include an emphasis on conserving remaining old forest stands and unroaded areas larger than 1,000 acres. Direct involvement with the other federal agencies, and State, county, and tribal governments will be used in planning, decision-making, and implementation of programs.

Reserves are selected for representation of vegetation and rare animal species. Reserves are large; the general rule is the bigger the better. Reserves need to cover all elevation ranges; currently most large reserves are found only at high elevations. Reserves need to be large enough so natural process can occur without the influence of humans and still maintain the communities they were selected to represent. No commercial timber harvest is permitted inside reserves, but limited silvicultural activities are allowed to enhance viable populations. Grazing is strictly limited to improve the long-term conditions for which the reserve was established. Dispersed, low-impact recreation use is allowed, including hunting and fishing, as long as these activities do not affect populations of rare species or their habitat. Management of reserves is focused on long-term maintenance of natural processes and conditions with which plant and animal species have evolved.

Under this alternative, the delineation of reserves was based on information in the *Scientific Assessment* and local sources, and the following criteria:

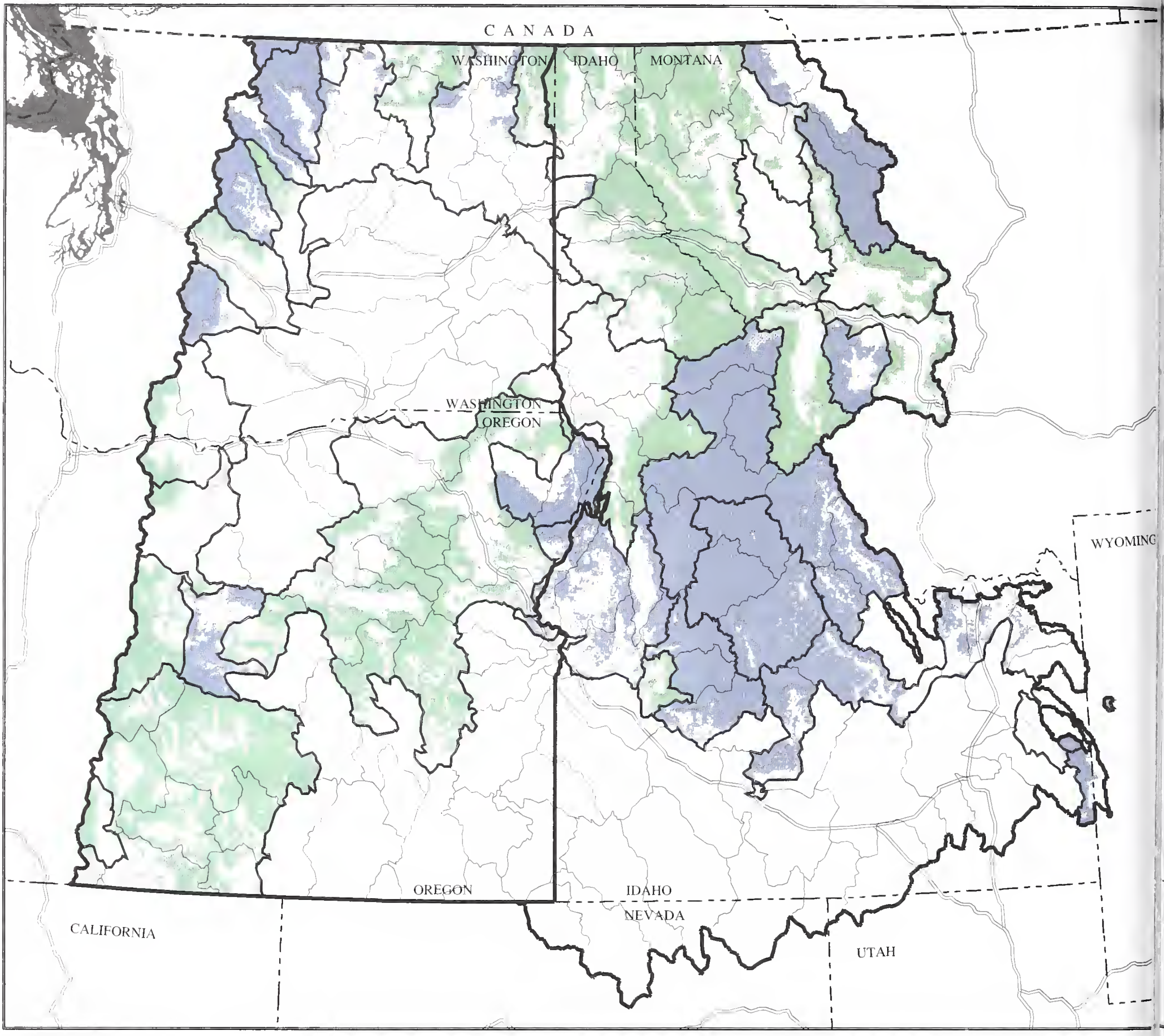
- Where they could be tied in with other habitats, current congressional reserves (such as designated Wilderness) and administrative reserves (such as Areas of Critical Environmental Concern) were used as a base when mapping large-scale reserves for Alternative 7. Areas that did not "fit" into the large-scale reserves would remain as currently designated.
- Habitats that support rare or narrowly distributed endemic species, as identified in the Terrestrial STAR (1996), were included.
- Large-scale reserves were overlaid on salmonid species strongholds, areas of high aquatic integrity, areas of narrowly distributed endemic fish species, and areas of important fringe populations of salmonid species.
- Where possible at least 20 percent of each major potential vegetation group was included within the large-scale reserves.
- Due to the large nature of the reserves, no attempt was made to distinguish between areas of high and low quality habitat. Approximately 42 percent of Forest Service- and BLM-administered lands became part of the reserve system.
- Large areas of core habitat for large carnivores were also included in the large-scale reserves delineation.

What is the Design of Alternative 7?

On BLM- and Forest Service-administered lands, Alternative 7 employs two basic emphases for management to enhance ecological integrity of, and viable populations on, forests and rangelands: Conserve and Conserve/Restore (see following table, and maps 3-20 and 3-21).

In general, natural processes and disturbance events will be allowed to occur essentially unimpeded by human action within the reserves. An emphasis is to restore fire as a natural disturbance process. However, limited management efforts may occur for some conditions where human action is considered necessary to achieve reserves objectives. The matrix, or surrounding area outside the reserves, would be managed with generally more active human intervention in disturbance processes.

Management actions in unroaded areas greater than 1,000 acres shall be the same as in large reserves. Unroaded areas are defined as those areas more than 50 feet slope distance from the edge of existing roadbeds and terminal points.

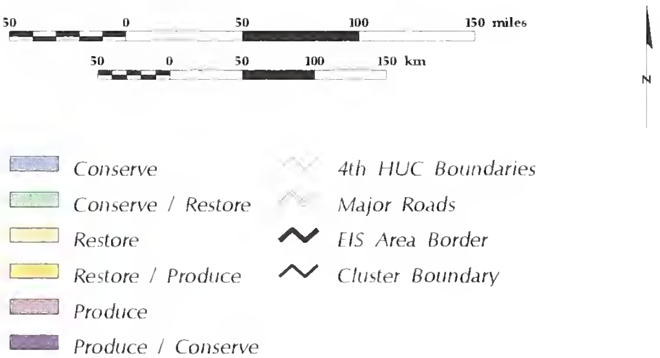


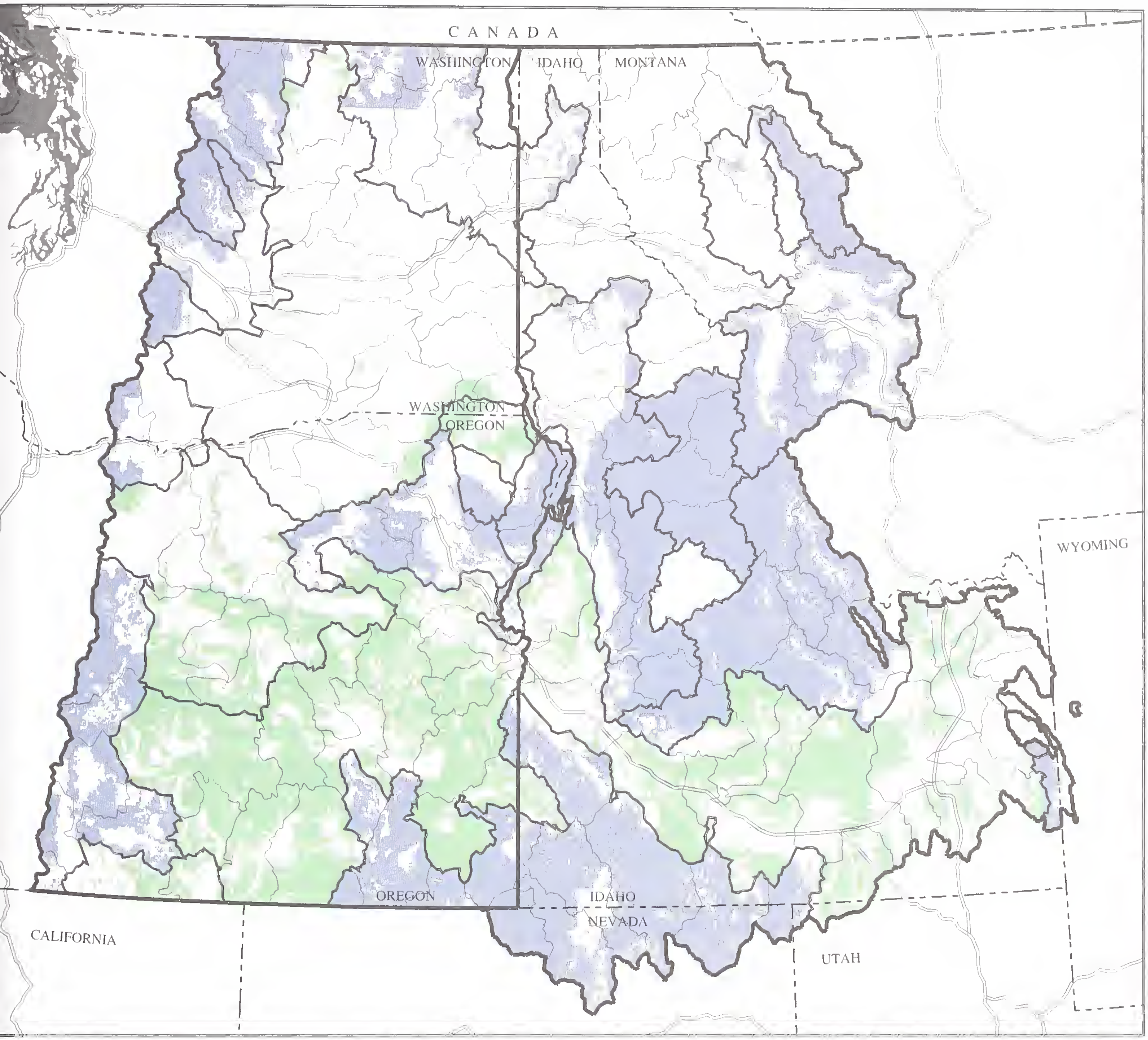
Map 3-20.
Alternative 7
Management Emphasis for Forest Clusters

BLM and Forest Service Administered Lands Only

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Project Area
1996



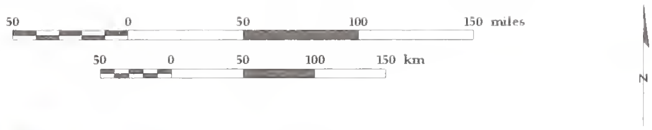


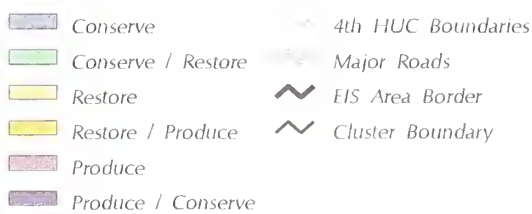
Map 3-21. Alternative 7 Management Emphasis for Range Clusters

BLM and Forest Service Administered Lands Only

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Project Area
1996





Activity tables (tables 3-6 and 3-7) are presented for each forest and range cluster by alternative to aid in analysis of effects and for projection of outcomes if Alternative 7 were selected.

The aquatic strategy in Alternative 7 is based in part on PACFISH and INFISH, and input from the Association of Forest Service Employees for Environmental Ethics (AFSEE) and the Columbia River Inter-Tribal Fish Commission (CRITFC). These reserves serve as a foundation for aquatic conservation. In addition, the alternative:

- Identifies all unroaded areas greater than 1,000 acres as strongholds for production and protection of clean water, aquatic, and riparian-dependent species.
- Establishes riparian conservation areas (RCAs) (similar to Alternative 3) and riparian management objectives (RMOs) based on PACFISH and various NMFS biological opinions. Ecosystem analysis is used to refine RCAs and RMOs.
- Provides standards that are more restrictive than PACFISH for RCAs and strongholds for some operational items including timber harvest, roads, livestock grazing, minerals management, and fire suppression. Ecosystem analysis is required for many operations.
- Pursues watershed restoration at relatively low levels compared to other alternatives.

Map 3-22 shows areas where ecosystem analysis is potentially required under Alternative 7.

Desired Range of Future Conditions

In addition to the desired range of future conditions elements common to all action alternatives, the following is the vision of the long-term (50-100 years) condition of the land under Alternative 7:

Terrestrial Ecosystems~Forestlands

Dry Forest Potential Vegetation Groups. In the dry forest potential vegetation groups, early successional stages and disturbance processes are maintained through endemic insect and disease disturbances, and fire.

Within reserves, there is a high occurrence and persistence of young forest dominated by ponderosa pine in the regeneration and young forest structural stages. Stands are fairly well distributed in a mosaic of age classes (Table 3-4).

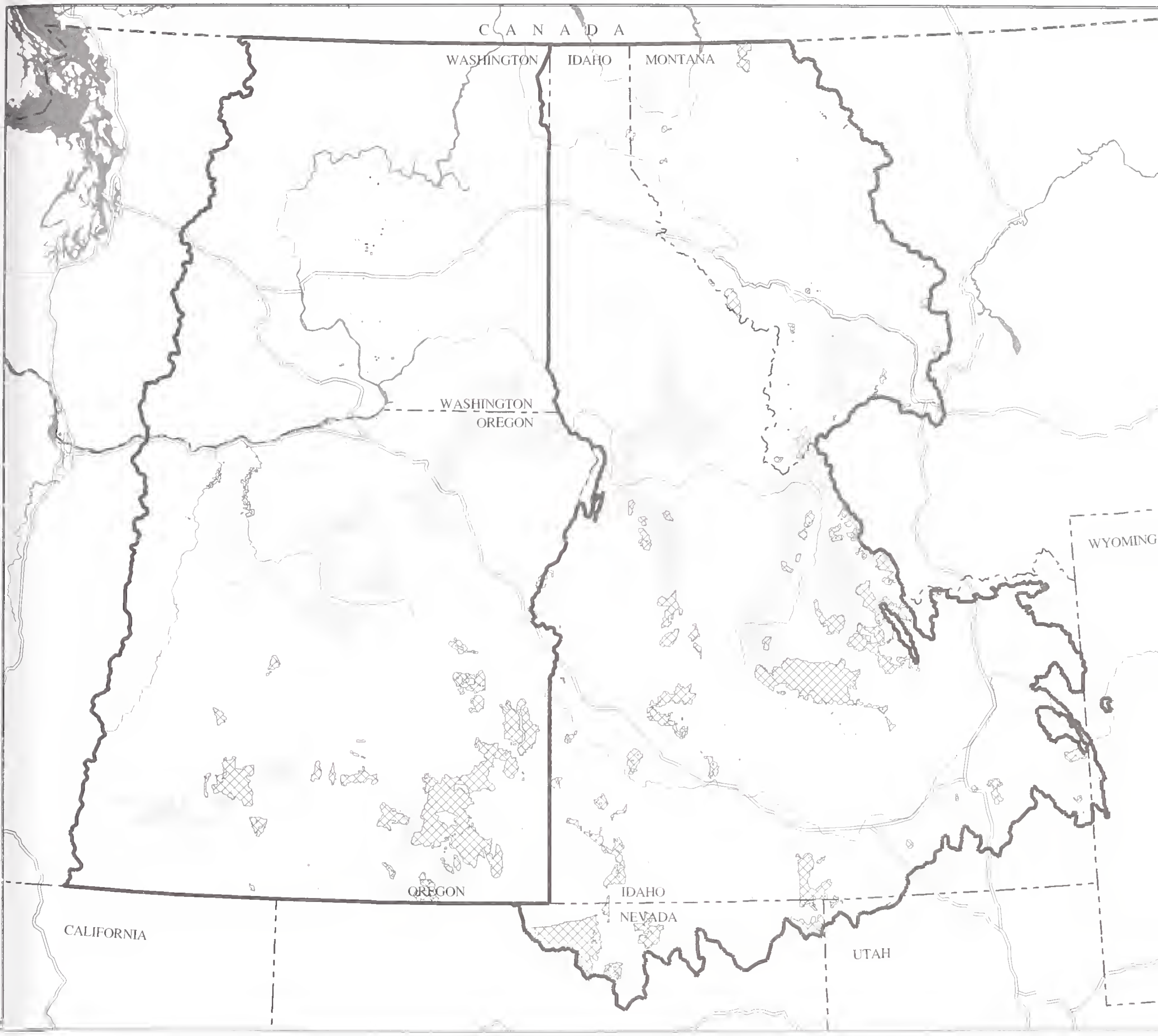
Outside reserves, there is a moderate occurrence of old single story forest dominated by ponderosa pine with a moderate component of Douglas-fir and a minor component of grand fir. Vegetation management is used in addition to natural disturbances and fire to maintain successional and disturbance processes. Stands are fairly well distributed in a mosaic of age classes (Table 3-4).

Moist Forest Potential Vegetation Groups. In the moist forest potential vegetation groups, early successional stages and disturbance processes are maintained through endemic insect and disease disturbances, windthrow often aided by root rot, and fire.

Within reserves, there is a high occurrence and persistence of regeneration, young forest, and old multi-story stages dominated by shade-intolerant species, grand fir/white fir, and Engelmann spruce/subalpine fir (Table 3-4). Outside the reserves there is a moderate occurrence and persistence of young forest consisting of western white pine, western larch, and ponderosa pine with a minor component of grand fir. Vegetation management is used in addition to natural disturbances and fire to maintain successional and disturbance processes. Stands are distributed in a mosaic of age classes (Table 3-4).

Alternative 7 - Management Emphasis Within Forest and Range Clusters in the Project Area

	Forest Cluster		Range Cluster	
	% of Forest Cluster	Cluster No.	% of Range Cluster	Cluster No.
Management Emphasis				
Conserve	43	1, 2, 6	52	2, 3, 5
Conserve/Restore	57	3, 4, 5	48	1, 4, 6



Map 3-22. Alternative 7 Potential Areas for Ecosystem Analysis at the Watershed Scale

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996

50 0 50 100 150 miles

50 0 50 100 150 km

N

Analysis Areas

Analysis required for human-ignited prescribed fire

Predicted road density at < 0.7 mi/square mile

Major Rivers

Major Roads

EIS Area Border

Ecosystem Analysis at the Watershed Scale is required before management activities in Category 1 sub-basins or prior to management activities that would affect federally listed and proposed species (not mapped) or recently occupied or currently accessible habitat of federally listed and proposed fish species. Also, Ecosystem Analysis at the Watershed Scale is required prior to road density increases in subwatersheds that have road densities < 0.7 miles/square mile.

In dry and moist forest potential vegetation groups not in the rural/wildland interface zone, where emphasis is to manage for timber production, two to three fire intervals (underburning (non lethal) and mixed behavior fire regimes) are skipped in some areas to accumulate small diameter trees in the understory and moderate closure of larger diameter overstory trees. In crown fire regimes, one to two fire intervals are skipped in some areas to accumulate moderate diameter trees in the overstory with scattered large residual trees.

Cold Forest Potential Vegetation Groups. In the cold forest potential vegetation groups, early successional stages and disturbance processes are maintained through fire and endemic insect and disease disturbances.

Within reserves, there is a high occurrence and persistence of regeneration, young forest, and old multi-story stages of Douglas-fir, lodgepole pine, and Engelmann spruce/subalpine fir. Stands are distributed in mosaics of age classes (table 3-4). Outside reserves, the young forest stage is dominated by early successional whitebark pine with a moderate component of Engelmann spruce/subalpine fir in a mosaic of age classes. Stands are distributed in large-patch mosaics of age classes (table 3-4).

The forested potential vegetation groups have an overall range of structural stages at the landscape level as shown in table 3-4.

Forest Wildlife Habitat

Within reserves, habitat is maintained to contribute to biodiversity, viable populations, and delisting of threatened or endangered species. All major vegetation types are included in large reserves, providing an adequate representation of wildlife habitats. Habitats ensure long-term evolutionary potential of native species. Old forest structure is dominated by large trees, both dead and alive, typical of that which developed with a natural disturbance regime. Old forest habitats provide for needs of old forest associated wildlife species.

Forested areas within reserves contain necessary structure, composition, and attributes of old forests. Reserves have often absorbed large disturbance events and impacts from activities adjacent to reserves and still provide sufficient habitat for viable populations. Reserves of all vegetation types are present in more than one location so that large-scale disturbances are less likely to disrupt the intent of the reserve in the short term. Human activities are at levels that allows all species to maintain their distribution. Densities of species may be low, but all expected species are present. Habitats of endemics, disjunct species, and centers of biodiversity of rare plant and animal species are being managed to meet these species needs. Road use restrictions are common to maintain population densities and prevent disturbances that will cause animals to be displaced.

Outside of reserves the desired range of future conditions for forested wildlife habitat is similar to that of Alternative 3.

Table 3-4. Desired Seral Stages at the Landscape Level for Alternative 7

PVG	Early	Mid	Mature[1] and Old[2] Multi	Mature & Old Single	Other[3]
Distribution (percentage of PVG)					
Dry (W)	20-35	35-45	5-15	5-20	0-15
Dry (O)	15-25	30-45	10-20	10-30	
Moist (W)	25-40	45-60	5-15	2-7	
Moist (O)	20-30	45-60	10-20	5-10	
Cold (W)	30-40	40-50	5-15	5-10	1-2
Cold (O)	25-35	40-50	10-20	5-15	
Shade-Intolerant Species (percentage of seral stages)					
Dry (W)	70-80	65-75	55-75	65-85	
Dry (O)	70-80	60-70	55-70	75-90	
Moist (W)	65-80	60-70	50-70	65-80	
Moist (O)	65-75	55-65	50-60	55-70	
Cold (W)	60-75	60-70	50-60	85-95	
Cold (O)	55-65	50-60	50-60	85-95	

[1] Mature refers to ages and sizes of dominant trees that are at least at culmination of mean annual increment of tree stand volume growth.
[2] Old refers to ages and sizes of dominant trees that are significantly beyond what may be found at culmination of mean annual increment of tree stand volume growth.
[3] Refers to understory of grasses, shrubs, and forbs.

(W) = within reserves; DRFCs actually represent expected ranges of future conditions over the very long-term. Ranges of future conditions over the next 50-100 years are relatively unpredictable
(O) = outside of reserves.

Terrestrial Ecosystems~Rangelands

Within Reserves. Where noxious weeds or other exotic plants have not dominated the vegetation

types, rangelands (especially the cool shrub areas) reflect a diverse mosaic of multiple-aged shrubs, forbs, and native grasses. Some seedings include native species, especially in the moist areas, and have become more diverse especially in the shrub component. Noxious weeds are increasing on the rangelands as a result of minimal control and due to the increasing competitiveness of noxious weeds with native plant species. The dry shrublands are especially affected by noxious weeds, with a majority already infested.

Western juniper encroachment onto dry grassland, dry and cool shrubland, and riparian areas, is retarded by natural fire where the understory vegetation provides adequate fine fuel to permit fire. Some juniper stands are being reduced in spatial extent by limited juniper cutting, especially those stands that (1) are of sufficient density that site biodiversity is being compromised, and (2) are not likely to be affected by wildfire. Western juniper presence is confined primarily, but not exclusively, to sites such as rock outcrops, ridges, mesas, and other sites that are not fire prone, which typically are characterized by low fine fuel accumulation and shallow soils. Conifers are being reduced by natural fire regimes on rangeland areas such as dry grassland.

Altered sagebrush steppe has occupied a majority of the dry shrub communities, especially the Wyoming sagebrush warm sites. Some altered sagebrush steppe areas, especially those in the more moist areas, are slowly moving toward a native plant community as native plants re-invade these areas. The slow conversion of altered sagebrush steppe sites to medusahead and yellow starthistle is apparent in some areas. Greenstripping and other fire breaks have been naturally colonized by some native species, although the seeded species is still dominant.

Outside Reserves. Same as Alternative 3, for the general description. The specific description by potential vegetation groups is described below.

Potential Vegetation Groups Within and Outside Reserves

Dry Grass Potential Vegetation Groups. Seventy to 90 percent of the area within reserves areas, and 50 to 70 percent of the area outside reserves, are dominated by native grasses and forbs without conifer and shrub encroachment.

Dry Shrub Potential Vegetation Groups. Twenty to 40 percent of the area in this group within reserves is dominated by native grasses and forbs with an overstory layer of shrubs. Five to 15 percent of the area within reserves is herbaceous-dominated. The remaining area within reserves is dominated by cheatgrass and noxious weeds, dense sagebrush canopy areas, and seedings. Forty to 60 percent of the area outside of reserves in the dry shrub potential vegetation group is dominated by shrub stages with a healthy understory layer in which native grasses and forbs are well represented. Five to 20 percent of the area is dominated by native grass and forb communities outside of reserves. The remaining area outside reserves is dominated by closed shrub communities with declining herbaceous layers, by annual grasses or by seedings of exotic grasses, and by other plants.

Cool Shrub Potential Vegetation Groups. Fifty to 70 percent of the area in this group is dominated by shrub stages with a healthy understory layer in which native grasses and forbs are well represented. Twenty to 40 percent of the area within reserves, and 10 to 30 percent of the area outside reserves, contains mixtures of perennial grasses and forbs. Conifers are dominant on 5 to 10 percent of the area within reserves, and less than 30 percent of the land outside reserves.

Rangeland Wildlife Habitat

All major rangeland cover types are included in the reserve system, providing representation of habitat and areas large enough to support all native species. Reserves represent the same habitats in several locations, to ensure that if a large disturbance event occurs in one reserve, the effects are short term relative to the communities represented in all reserves. Human activities are at levels that allow species to maintain expected distribution and abundance for the habitats represented. Few roads are located within reserves. Because of these conditions, biodiversity, viable populations, and continued recovery of federally listed threatened and endangered species is occurring within reserves.

Rangeland habitat attributes outside of reserves are meeting the needs of endemic species, but not to the same extent as within reserves. Vegetation conditions are not barriers to movement of species between reserves. Conditions outside of reserves do not cause

reserves to become islands of habitat. Human activities are at levels that allow all species to maintain distribution and abundance, but densities may be reduced. Use of roads is regulated as needed to maintain habitat effectiveness for species persistence.

Aquatic Ecosystems

Within Reserves. Riparian areas within reserves are resilient, diverse, and functioning within their site potential. Many less resilient, more sensitive areas are recovering. Tall trees, moderate or large in diameter, are fairly frequent within riparian areas. Riparian areas are covered by protective vegetation and generally connected with their streams and upslopes. In rangeland reserves, riparian area soils are dominated by native, deep-rooted plants, and shrubs are especially common along streambanks. Wetlands are prevalent across the lower gradient valley bottoms.

Streams within reserves are generally productive, having a diversity and complexity of habitat. Stream cover and structure from inputs of large wood and bank vegetation are abundant. Substrates consist of a variety of particle sizes, which accommodate the spawning and rearing needs of aquatic species. Large, deep, and complex pools are common.

Most soils within reserves have protective cover, adequate levels of soil organic matter, and coarse woody material that is well distributed in varying sizes and plant parts. Soils also have adequate physical properties for vegetation growth and hydrologic function. Physical, chemical, and biological processes of all soils function similarly to comparable soils which have not been harmfully disturbed.

There is little evidence of openings from old road corridors across the landscape within reserves, in riparian areas, or elsewhere, and no evidence of new openings from road corridors.

Aquatic Species Habitat

Restoration strategies have been implemented on nearly all high-risk sites within reserve areas. This allows recovery of watershed, riparian, water quality, and aquatic conditions characteristic for that geoclimatic setting. Improved aquatic habitat conditions allow threatened or endangered aquatic species populations to stabilize and expand into previously occupied habitat. Native aquatic species population strongholds have increased. Major river corridor conditions allow near full expression of aquatic life histories.

Outside Reserves. Riparian areas outside of reserves are mostly resilient and becoming diverse. Tall trees are apparent in riparian areas. Most non-reserve riparian areas are connected to their upslopes and streams. In rangelands outside of reserves, most riparian area soils are covered by native vegetation. Wetlands are visible and frequent in the lower gradient valley bottoms.

Streams are moderately productive and complex. Large, deep, and complex pools are present in many streams.

Most soils have protective cover, adequate levels of soil organic matter, and coarse woody material.

The following desired range of future conditions also applies in Alternative 7:

- ◆ The distribution, diversity, and complexity of watershed and landscape-scale features are maintained and restored to ensure protection of the aquatic systems to which species populations and communities are uniquely adapted.
- ◆ Spatial and temporal connectivity within and between watersheds are maintained and restored. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact strongholds. These connections will provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

Human Uses and Values

Social and economic systems have adjusted to changes in the location, amounts, and product mix of commodity and non-commodity outputs from Federal lands in different parts of the project area.

Human use and activities are very low within reserves but increase with distance away from reserve boundaries. Restoration actions within reserves are completed within 10 to 20 years.

In areas most affected by reserves, economic and social adjustments have completed a shift away from commodity outputs and toward deriving the economic and social benefits of protected biological resources. Outside reserves, economic and social systems have adjusted to decreased outputs of commodities.

Objectives and Standards

The objectives, standards, and guidelines that follow for Alternatives 1 and 2 (the no action alternatives) are representative of the types of direction currently in effect in the 47 BLM and Forest Service land-use plans in the Upper Columbia River Basin EIS area. Because these plans were written at different times, by different teams from different agencies, few if any of the objectives, standards, or guidelines listed here are written exactly like those in the plans.

Objectives and standards for Alternatives 3 through 7 are found in table 3-5, which follows the descriptions of Alternatives 1 and 2. Guidelines for Alternatives 3 through 7 that describe how the objectives and/or standards could be implemented are listed in Appendix H. They were put in the appendix to emphasize that they are optional, not required, actions that could be used under each alternative. Guidelines for Alternatives 1 and 2 are included with the objectives and standards in this chapter because they are representative, not necessarily actual, guidelines.

Definitions

Objectives ~ Indicators used to measure progress toward attainment of goals. They address short- and long-term actions taken to meet goals and the desired ranges of future conditions. Unless otherwise stated, all objectives listed here are assumed to be implemented within 10 years.

Standards ~ Required management actions addressing how to achieve objectives. Standards can include requirements to refrain from taking action in certain situations.

Guidelines ~ Suggested actions, priorities, processes, or prescriptions that are useful in meeting objectives. They are not required. Guidelines are listed in Appendix H.

Some of the objectives and standards place priority or emphasis for particular activities in certain forest or range clusters. This is intended to demonstrate where, at the broad scale, general priorities and emphasis should be. It in no way precludes similar activities in other clusters. Mid-level analysis, as described in the various objectives and standards as well as in Appendix I, is a process that is intended to verify broad-scale information and emphasis, and identify additional opportunities.

One of six management emphases was given to each forest and range cluster (see last section in Chapter 2 for definition). The emphases are conserve, restore, produce, conserve-restore, conserve-produce, and restore-produce. The primary three emphases are defined below. See the User's Guide at the end of this chapter for more information.

Conserve ~ Management emphasis is on protection and maintenance of forest, rangeland, and aquatic conditions, health, and integrity. Management recognizes that natural processes dominate the landscape and gradual change will occur. Generally, the conserve emphasis is applied as the primary management emphasis to areas with moderate to high ecological integrity. Secondarily, the restore or produce emphasis is applied when associated benefits can be provided.

Restore ~ Management emphasis is designed to move ecosystems to desired conditions and processes, and/or to healthy forestlands, rangelands, and aquatic systems. A variety of management-induced activities dominate the landscape. Generally, restore emphasis is applied to areas of moderate to low ecological integrity. Secondarily, the conserve emphasis is applied to areas with high integrity, and the produce emphasis is used when associated benefits can be provided.

Produce ~ Management emphasis is directed at providing, growing, or making goods and services available for human needs and/or desires, while sustaining productivity and maintaining associated values. Under produce emphasis, consumption-based activities dominate the landscape. This management emphasis is applied to areas available and suitable for

resource production in order to provide goods and services. A restore emphasis may be used secondarily when production can be benefited.

Objectives are intended to move conditions toward the desired ranges of future conditions described for alternatives and to be implemented within 10 years. Objectives will differ among alternative and clusters according to different emphasis or combinations of emphasis as described by using the words restore, conserve, or produce. Although these alternatives by clusters may have emphasis to restore or conserve or produce something, this does not indicate that there are no other major uses of resources. For example, production of forage for livestock grazing is still a major part of all alternatives even though there may not be an emphasis to produce livestock forage in an objective. It is expected that restoration, conservation, and production activities would occur in all alternative even if they are not emphasized in an objective.

Alternative 1

Physical Environment

Soil

A1/PE-O1. Objective: Plan and conduct land uses and management activities to minimize loss of site potential caused by detrimental erosion, compaction, displacement, puddling, and severe burning.

A1/PE-O2. Objective: Maintain at least 80 percent of each activity area in condition of acceptable productivity potential.

A1/PE-O3. Objective: Use management practices that ensure:

- Adequate amounts of ground cover to support infiltration, maintain soil moisture storage, and stabilize soils.
- Permeability rates are appropriate to climate and soils.
- Adequate nutrient capital and functioning cycles.

A1/PE-O4. Objective: Where detrimental effects have occurred, plan and implement rehabilitation to meet soil and water objectives and standards.

A1/PE-O5. Objective: Stabilize lands disturbed as a result of activities to control soil erosion.

Air Quality

A1/PE-O6. Objective: Meet State air quality requirements.

A1/PE-S1. Standard: Prescribed burning shall be planned and conducted in accordance with State Smoke Management Plans and State Implementation Plans of the Clean Air Act.

A1/PE-G1. Guideline: Smoke management mitigation measures may be used to reduce emissions from prescribed burning.

A1/PE-S2. Standard: Reduce total emissions from prescribed burns to prevent significant deterioration.

A1/PE-G2. Guideline: Prescribed fire and other fuels management may be used to reduce the potential for wildfire emissions.

Terrestrial Ecosystems

Fire Management

A1/TE-O1. Objective: Manage wildland fire to protect human life and property and to minimize loss of resource values.

A1/TE-S1. Standard: All wildfires shall receive a prompt and appropriate suppression response as defined by the agency.

A1/TE-S2. Standard: Priorities for fire suppression shall be the protection of human life, public safety, private property, and improvements or investments.

A1/TE-G1. Guideline: Minimum impact suppression methods can be used.

A1/TE-G2. Guideline: Prescribed fire can be used to meet vegetation management objectives and to reduce and maintain appropriate fuel profiles. Unplanned ignition may be used if a prescribed fire plan has been developed and the fire is within prescription.

A1/TE-G3. Guideline: Consider managing residue profiles at a level to minimize the potential of high intensity catastrophic wildfire and provide for other resource objectives.

Noxious Weeds

A1/TE-O2. Objective: Integrate noxious weed management into project and activity planning to contribute to the prevention, detection, control, and eradication of noxious weeds.

A1/TE-S3. Standard: Plans and actions for control of competing and unwanted vegetation (including noxious weeds) shall be consistent with *Managing Competing and Unwanted Vegetation* (USDA, Forest Service 1988), *Vegetation Treatment on BLM Lands in Thirteen Western States (ROD)* (USDA, BLM 1991), *Northwest Area Noxious Weed Control Program (ROD)* (USDI BLM 1987), or similar agency direction.

Forested Lands

A1/TE-O3. Objective: Use timber management activities to promote horizontal and vertical vegetative diversity to help meet wildlife, aesthetic, recreational, and other objectives.

A1/TE-S4. Standard: Allow regulated timber harvest only on lands classified as suitable for timber management. Prohibit timber harvest on lands unsuitable for timber management, except where needed to accomplish other multiple-use objectives.

A1/TE-S5. Standard: Selection of appropriate silvicultural systems should:

- ◆ Meet the management objectives and management area or resource emphasis;
- ◆ Permit the production of a volume of marketable trees sufficient to use all trees that meet utilization standards defined in agency guidelines and are designated for harvest;
- ◆ Permit the use of acceptable logging methods that can remove logs and other products without excessive damage to the identified desirable retained vegetation;
- ◆ Be capable of meeting or providing special management conditions and achieve particular multiple-use management objectives (such as streamside protection, wildlife needs, and visual enhancement);
- ◆ Permit control vegetation and use appropriate practices to establish desired species, composition, density and rates of growth of trees and other vegetation needed to achieve objectives;
- ◆ Promote stand structures and species composition that minimize serious risk of damage caused by mammals, insects, disease, or wildfire, and that allow treatment of existing insect, disease, or fuel conditions;
- ◆ Assure that lands can be adequately restocked within time frames; and
- ◆ Be practical and economic in terms of transportation, harvesting, preparation, and administration of timber sales.

A1/TE-S6. Standard: Clearcutting should be allowed only when it is found to be the optimum harvest method.

A1/TE-G4. Guideline: The variety of management intensities and silvicultural practices can be used, singly or in combination, and will vary by site conditions and productivity, timber species, resource management objectives, and timing of implementation.

A1/TE-G5. Guideline: Appropriate silvicultural practices can include site preparation, tree improvement, reforestation, release and weeding, thinning, fertilizing, pruning, sanitation harvest, salvage harvest, even-aged harvest (shelterwoods, seed tree, clearcuts), and uneven-aged harvest (individual tree and group selection). Regeneration and tree stocking standards are defined at the local area.

A1/TE-S7. Standard: Lands scheduled for timber harvest using even-aged practices should be managed on rotation(s) equal to or greater than 95 percent of culmination of mean annual increment of growth (based on cubic foot measure).

A1/TE-S8. Standard: Where appropriate, stagger regeneration in space and time for even-aged areas. Created openings should be separated by blocks of land or areas not classed as created opening. Harvested areas are not eonsidered a created opening for timber management when tree stocking is above minimum levels, and when trees are four feet in height and free to grow.

A1/TE-S9. Standard: Openings created by even-aged harvesting should not exceed 40 acres; exceptions are permitted under catastrophic conditions.

A1/TE-O4. Objective: Provide for salvage harvest of timber killed or damaged by events

such as wildfire, wind storms, and insects and diseases, consistent with management objectives for other resources.

Rangelands

A1/TE-O5. Objective: Make suitable rangelands available for grazing and browse use in coordination with other uses and protection of productivity.

A1/TE-S10. Standard: Allocate forage on allotment or management area to meet basic plant, plant vigor, and soil needs as first priority.

A1/TE-S11. Standard: Use the forage utilization standards defined in agency guides; use levels should be consistent with objectives established by land-use plans.

A1/TE-G6. Guideline: Set forage utilization standards (stocking rates) for livestock, wild horses and burros, and big game for riparian and upland areas based on species type, current allotment condition, and range management strategy.

A1/TE-G7. Guideline: Design grazing systems to maintain or improve plant vigor.

A1/TE-S12. Standard: Range project plans or allotment management plans and, where applicable, wild horse and burro herd management plans, shall be developed, revised, and maintained. These plans establish objectives for managing vegetation resources (including activities needed to achieve the objectives) to achieve desirable riparian conditions (including improvement schedule if needed, grazing system, season of use, class of livestock, stocking levels, forage products and utilization rates, improvements needed to achieve objectives, economic efficiency analysis and coordinating requirements).

A1/TE-G8. Guideline: Intensive range management practices, including rest, may be used to protect and improve riparian vegetation and fish and wildlife habitats.

A1/TE-G9. Guideline: To stabilize soils and to improve livestock forage conditions and wildlife habitat, seed poor condition rangelands to a site-specific mixture of native or desirable exotic grasses, forbs, and shrubs. Use seedings to release grazing pressure from native range to improve condition.

A1/TE-G10. Guideline: To stabilize soils after wildfire, seed rangelands that have a low potential for natural recovery with a site-specific mixture of native or desirable exotic grasses, forbs, and shrubs.

A1/TE-G11. Guideline: Provide periods of rest from disturbance or livestock use during times of critical plant growth to maintain or improve vegetation condition.

Terrestrial Species and Habitats

A1/TE-O6. Objective: Provide habitat for viable populations of existing native and desirable non-native vertebrate wildlife species.

A1/TE-S13. Standard: Old/mature tree habitat (reserve where appropriate, or develop replacement habitat where presently unavailable) should be maintained and well distributed across the landscape for indicator species dependent on old forests. Meet key species requirements by managing (reserve) areas of appropriate size and arrangement with the following characteristics: adequate larger, older trees; proper stand structures and densities (usually multi-storied); snags and downed logs; associated feeding habitat; and other criteria.

A1/TE-S14. Standard: Adequate dead trees (snags) should be left to provide the required numbers and size of snags throughout the forest to maintain primary cavity excavators at 40 to 60 percent of their potential population in timber production areas and appropriate levels in other areas; leave appropriate levels of green trees to serve as a source of future snags.

A1/TE-S15. Standard: Dead and downed logs should be provided in appropriate numbers by size classes to support wildlife species that use this resource.

A1/TE-S16. Standard: Forest stands and shrub and grassland communities and successional stages should be managed to provide suitable big game habitat(s), cover quality, cover size and spacing, open road densities, and forage quality to meet species needs as defined in a Habitat Effectiveness Index.

A1/TE-S17. Standard: Big game habitats including winter ranges, calving/fawning areas, wallows, and migration areas, should be protected at key times by maintaining desired vegetative structure and characteristics.

A1/TE-S18. Standard: Unique or featured wildlife habitats, including cliffs, talus, caves,

seeps-springs, bogs, wallows, and other wet areas (generally under 10 acres), should be managed to protect their primary values.

A1/TE-S19. Standard: For Federal threatened, endangered, candidate, and special status species, use required biological assessment/ evaluation procedures and meet consultation requirements. Promote preservation, restoration, and/or maintenance of habitats.

Wilderness and Reserves

A1/TE-O7. Objective: Manage Wilderness Areas and reserves for natural ecological processes with minimal human interference; preserve and protect natural conditions, processes, and wilderness character.

A1/TE-G12. Guideline: In Wilderness Areas and reserves, replicate natural processes, disturbance events, and cycles with prescribed fire(s). (Naturally occurring fires are considered prescribed fires until declared a wildfire [outside of prescription]. Wildfires may be suppressed using appropriate agency suppression strategies.)

A1/TE-S20. Standard: In Wilderness Areas and reserves, recreation, range, and other permitted activity use and facilities shall be managed to meet wilderness objectives and preserve wilderness character and values.

A1/TE-G13. Guideline: In Wilderness Areas and reserves, the limits of acceptable change process can be used to determine management actions to preserve natural environments and provide for wilderness experiences.

A1/TE-S21. Standard: Timber harvest and motorized vehicle access shall be prohibited in Wilderness Areas and reserves, except for emergencies or other authorized exceptions.

A1/TE-S22. Standard: Manage Wilderness Study Areas to protect and preserve their wilderness characteristics. Protect and preserve special resource values of Areas of Critical Environmental Concern.

Aquatic Ecosystems

A1/AQ-O1. Objective: Inventory, treat, and improve conditions in watersheds in need of restoration to reverse and arrest adverse impacts to water quality and fish habitat. Areas where fish habitat(s) or water quality have been adversely affected shall be given high priority for corrective treatments that mitigate impacts or rehabilitate these areas.

A1/AQ-S1. Standard: Meet or exceed State water quality protection and restoration and Federal Endangered Species Act requirements through planning, application, and monitoring of best management practices (BMPs).

A1/AQ-S2. Standard: Beneficial uses shall be protected by implementing water quality practices, plans, and policies in current memoranda of understanding with the States.

A1/AQ-S3. Standard: Proposed projects or management actions shall be evaluated for cumulative effects on water quality, quantity, and stream channels.

In this EIS, the following terminology has been used to distinguish standards from guidelines (Source: Forest Service Directive 1110.8, Degree of Compliance or Restriction in Directives):

Verb	Degree of Compliance/Restriction	Applies to
must, shall	Action is mandatory.	Standards
should	Action is required unless other actions (including non-action) fully meet the intent of the standard.	Standards
may, can, could	A suggested technique, which is optional.	Guidelines
will	Applies only to statement of future condition or an expression of time. Not to be used in place of shall or must.	Desired Range of Future Conditions

A1/AQ-G1. Guideline: Consider dispersing activities in time and space, where practicable, to the extent needed to meet management requirements.

A1/AQ-O2. Objective: Provide and maintain a diverse, well distributed pattern of fish habitat to aid in increasing anadromous fish runs, by:

- Meeting criteria in State water quality standards for stream temperature and provision of stream side vegetation;
- Maintaining sufficient large woody debris to provide for continuous long-term supply in all channels;
- Promoting bank, floodplain, and channel stability to provide resiliency to disturbance and foster aquatic diversity;
- Providing pools that are large, well distributed, and persistent during low flows, and conserving or restoring channel morphology appropriate to the climate and landform; and
- Providing for cover in grass-forb, shrub, and tree dominated sites in riparian areas.

A1/AQ-G2. Guideline: Practices that maintain or promote sufficient residual vegetation can be used to maintain, improve, or restore riparian and wetland functions. Practices that maintain or promote appropriate channel morphology and functions may be used.

A1/AQ-O3. Objective: Achieve riparian and wetland area improvement and maintenance through management of existing uses, wherever feasible.

A1/AQ-O4. Objective: Maintain or improve riparian and wetlands to Properly Functioning Condition.

A1/AQ-O5. Objective: Limit or mitigate ground disturbance in floodplains, riparian areas, and aquatic habitats to prevent soil movement, loss, and sedimentation.

Human Uses and Values

A1/HU-O1. Objective: Provide a broad spectrum of developed and dispersed recreation opportunities and activities in a range of settings.

A1/HU-S1. Standard: Use the recreation opportunity spectrum (ROS), or appropriate agency direction, to guide inventory and management to meet goals for recreation settings and experiences.

A1/HU-S2. Standard: Manage recreation settings and facilities to provide safe and sanitary recreation experiences, protect facilities, sites and resources, and meet user needs.

A1/HU-S3. Standard: Protect and manage established dispersed recreation sites and special places.

A1/HU-O2. Objective: Maintain and enhance the visual character of the landscape.

A1/HU-S4. Standard: Meet or exceed established visual quality objectives using management principles and ecological techniques from the appropriate agency Landscape Management Systems.

A1/HU-O3. Objective: Coordinate management of lands, resources, and activities administered by the BLM or Forest Service with local, State, and Federal agencies; private landowners; American Indian tribes; and interest and user groups.

A1/HU-G1. Guideline: Developing and strengthening partnerships can be emphasized while managing and enhancing resource use (fish, wildlife, recreation, others).

A1/HU-G2. Guideline: Coordinate fire management activities in rural interface areas with local governments, agencies, and landowners.

A1/HU-O4. Objective: Foster public awareness of, involvement in, and support for National Forest and BLM District land management objectives and programs.

A1/HU-O5. Objective: Support strategies that enhance rural community economic advancement; define complementary roles and implement programs that best serve the public. Assist in providing developmental, tourism, and recreational activities that help diversify rural economies and improve quality of life that attracts in-migration related to amenities.

A1/HU-S5. Standard: Provide a predictable supply of timber and other forest products within sustainable limits of the ecosystem(s).

A1/HU-S6. Standard: Provide a predictable supply of livestock and wild horse forage within sustainable limits of the ecosystem.

Tribal Interests

A1/HU-O6. Objective: Provide for ceded land rights and treaty privileges of American Indians.

A1/HU-O7. Objective: Consult and coordinate planning and management activities with the tribes.

Locatable Minerals

A1/HU-O8. Objective: Provide opportunity for the exploration and development of mineral resources in areas identified as open to operations, subject to appropriate regulations.

A1/HU-S7. Standard: As required by applicable mining laws, provide access for exploration and development of locatable mineral resources.

A1/HU-S8. Standard: Where necessary to protect important lands and resources, mineral exploration and development shall be subject to additional restrictions or stipulations. The least restrictive limitations necessary for resource protection should be used.

A1/HU-S9. Standard: Where practical, surface disturbance from mining operations shall be reclaimed by taking measures that will prevent or control on-site and off-site damage to the environment and surface resources.

Leasable Minerals

A1/HU-O9. Objective: Provide leasing opportunities for oil, gas, coal, and geothermal exploration and development subject to appropriate regulations and requirements in areas identified as open to operations.

A1/HU-S10. Standard: Provide access for exploration and development of leasable mineral resources, subject to applicable laws and regulations.

A1/HU-S11. Standard: All exploration applications shall receive appropriate environmental review and NEPA documentation prior to authorization.

A1/HU-S12. Standard: In order to protect special resource values and investments, leasing shall be subject to appropriate lease notices and lease stipulations.

A1/HU-S13. Standard: Ensure that operations are in compliance with appropriate regulations and that inspections are conducted in accordance with agency policies and procedures.

A1/HU-S14. Standard: All surface disturbance from mining operations should be reclaimed to a productive condition, to the extent reasonable and practicable.

A1/HU-O10. Objective: Provide and manage a safe and economical transportation system to provide public access and meet resource and protection objectives.

A1/HU-S15. Standard: Plan, develop, operate, and maintain leasable mineral activity sites according to agency standards and objectives for planned uses and activities, safety, economics, and impacts on lands and resources.

Implementation, Adaptive Management, and Monitoring

A1/IA-O1. Objective: For riparian areas, set measurable objectives and monitoring for key parameters such as stream surface shading, streambank stability, and shrub cover.

A1/IA-S1. Standard: Ensure that operations are in compliance with appropriate regulations and that inspections are conducted in accordance with agency policies and procedures.

Alternative 2

Physical Environment

Same direction as Alternative 1.

Terrestrial Ecosystems

Forested Lands

Same direction as Alternative 1.

Rangelands

Same direction as Alternative 1.

Terrestrial Species and Habitats

Same direction as Alternative 1.

Wilderness and Reserves

Same direction as Alternative 1.

Aquatic Ecosystems

Same direction as Alternative 1. In addition, the following objectives and standards apply to areas identified in decision notices for PACFISH, INFISH, and/or BLM statewide Interim Bull Trout Habitat Conservation Strategies. All standards apply to all four objectives. See Appendix G/3-4 for additional information.

A2/AQ-O1. Objective. Manage and provide aquatic habitat to contribute to the maintenance of stocks of anadromous and inland native fish and to ensure consistent, effective, and efficient Endangered Species Act consultation.

A2/AQ-O2. Objective. Provide protection for all watersheds containing designated critical habitat for listed anadromous fish (Key Watersheds).

A2/AQ-O3. Objective. Provide a pattern of protection across the landscape with an emphasis on bull trout for watersheds that have strong assemblages of inland native fish, degraded watersheds with a high restoration potential, and watersheds that provide for metapopulation objectives (Priority Watersheds).

A2/AQ-O4. Objective. Improve current conditions of watersheds by restoring degraded habitat and providing long-term protection to natural resources, including riparian and aquatic resources.

A2/AQ-S1. Standard. Prohibit timber harvest, including fuelwood cutting, in Riparian Conservation Areas (RCAs), except as described below. Do not include RCAs in the land base used to determine the Allowable Sale Quantity; however, any volume harvested can contribute to the timber sale program.

a. Where catastrophic events such as fire, flooding, volcano, wind, or insects cause damage that results in degraded riparian conditions, allow salvage and fuel cutting in RCAs only where present and future woody debris needs are met, where cutting would not retard or prevent attainment of other Riparian Management Objectives (RMOs), and where adverse effects can be avoided to aquatic resources. Ecosystem analysis at the watershed scale shall be completed prior to harvest, including salvage and fuelwood cutting, in RCAs.

b. Apply silvicultural practices for RCAs to acquire desired vegetation characteristics where needed to attain RMOs. Apply silvicultural practices in a manner that does not retard attainment of RMOs and that avoids adverse effects on aquatic resources.

A2/AQ-S2. Standard. Cooperate with Federal, tribal, State, and county agencies and cost-share partners to achieve consistency in road design, operation, and maintenance necessary to attain RMOs.

A2/AQ-S3. Standard. For each existing or planned road, meet the RMOs and avoid adverse effects on aquatic resources as described below:

a. Ecosystem Analysis at the watershed scale shall be completed prior to construction of new roads or landings in RCAs.

b. Road and landing locations in RCAs shall be minimized.

c. Initiate development and implementation of a Road Management Plan or a Transportation Management Plan. At a minimum, the plan shall address the following items:
- Road design criteria, elements, and standards that govern construction and reconstruction.
- Road management objectives for each road.
- Criteria that govern road operation, maintenance, and management.
- Requirements for pre-, during-, and post-storm inspections and maintenance.
- Regulation of traffic during wet periods to minimize erosion and sediment delivery and accomplish other objectives.
- Implementation and effectiveness of monitoring plans for road stability, drainage, and erosion control.
- Mitigation plans for road failures.

d. Avoid sediment delivery to streams from the road surface. Outsloping of the roadway surface is preferred, except in cases where outsloping would increase sediment delivery to streams or where outsloping is infeasible or unsafe. Route road drainage away from potentially unstable stream channels, fills, and hillslopes.

e. Avoid disruption of natural hydrologic flow paths.

f. Avoid side casting of soils or snow. Side

casting of road materials is prohibited on road segments within or abutting RCAs.

A2/AQ-S4. Standard. Determine the influence of each road on RMOs. Meet RMOs and avoid adverse effects on aquatic resources by:

a. Reconstructing road and drainage features that do not meet design criteria or operation and maintenance standards, that have been shown to be less effective than designed for controlling sediment delivery, that retard attainment of RMOs, or that do not protect watersheds from increased sedimentation.

b. Prioritizing reconstruction based on the current and potential damage to aquatic resources and their watersheds, the ecological value of the riparian resources affected, and the feasibility of options such as helicopter logging and road relocation out of RCAs.

c. Closing and stabilizing or obliterating and stabilizing roads not needed for future management activities. Prioritize these actions based on the current and potential damage to aquatic resources in watersheds and the ecological value of the riparian resources affected.

A2/AQ-S5. Standard. Improve existing culverts, bridges, and other stream crossings to accommodate a 100-year flood, including associated bedload and debris, where those existing structures would or do pose a substantial risk to riparian conditions. Such improvements should include those structures that do not meet design and operation maintenance criteria, that have been shown to be less effective than designed for controlling erosion, or that retard attainment of RMOs. Priority for upgrading shall be based on risks and the ecological value of the riparian resources affected. Construct and maintain crossings to prevent diversion of streamflow out of the channel and down the road in the event of crossing failures.

A2/AQ-S6. Standard. Provide and maintain fish passage at all crossings of existing and potential fish-bearing streams.

A2/AQ-S7. Standard. Modify grazing practices (for example, accessibility of riparian areas to livestock, length of grazing season, stocking levels, timing of grazing) that retard or prevent attainment of RMOs or are likely to adversely affect aquatic resources. Suspend grazing if adjusting practices is not effective in meeting RMOs.

A2/AQ-S8. Standard. New livestock handling and/or management facilities shall be located outside of RCAs. For existing livestock handling facilities inside RCAs, assure that facilities do not prevent attainment of RMOs. Relocate or close facilities where these objectives cannot be met.

A2/AQ-S9. Standard. Limit livestock trailing, bedding, watering, loading, salting, and other handling efforts to those areas and times that would not retard attainment of RMOs or adversely affect aquatic resources.

A2/AQ-S10. Standard. Adjust wild horse and burro management to avoid impacts that prevent attainment of RMOs or adversely affect aquatic resources.

A2/AQ-S11. Standard. Avoid adverse impacts to listed species and designated critical habitat from mineral operations. If the Notice of Intent indicates that a mineral operation would be located in an RCA, could affect attainment of RMOs, or could adversely affect listed anadromous fish, then require a reclamation plan, approved Plan of Operations (or other such governing document), and reclamation bond. For effects that cannot be avoided, such plans and bonds must address the following items to attain RMOs and avoid adverse effects on listed anadromous fish: the costs of removing facilities, equipment, and materials; recontouring disturbed areas to near pre-mining topography; isolating and neutralizing or removing toxic or potentially toxic materials; salvage and replacement of topsoil; and seedbed preparation and revegetation. Ensure Reclamation Plans contain measurable attainment and bond release criteria for each reclamation activity.

A2/AQ-S12. Standard. Locate structures, support facilities, and roads outside RCAs. Where no alternative to siting facilities in RCAs exists, locate and construct the facilities in ways that avoid impacts to RCAs and streams and that avoid adverse effects on aquatic resources. Where no alternative to road construction exists, keep roads to the minimum necessary for the approved mineral activity. Close, obliterate, and revegetate roads no longer required for mineral or land management activities.

A2/AQ-S13. Standard. Prohibit solid and sanitary waste facilities in RCAs. If no alternative to locating mine waste (waste rock, spent ore, tailings) facilities in RCAs exists, and

if releases can be prevented and stability can be ensured, then:

a. Analyze the waste material using the best conventional sampling methods and analytic techniques to determine its chemical and physical stability characteristics.

b. Locate and design the waste facilities using the best conventional techniques to ensure mass stability and prevent the release of acid or toxic materials. If the best conventional technology is not sufficient to prevent such releases and ensure stability over the long term, prohibit such facilities in RCAs.

c. Monitor waste and waste facilities to confirm predictions of chemical and physical stability, and make adjustments to operations as needed to avoid adverse effects to aquatic resources and to attain RMOs.

d. Reclaim and monitor waste facilities to assure chemical and physical stability and revegetation, to avoid adverse effects to aquatic resources, and to attain the RMOs.

e. Require reclamation bonds adequate to ensure long-term chemical and physical stability and successful revegetation of mine waste facilities.

A2/AQ-S14. Standard. For leasable minerals, prohibit surface occupancy within RCAs for oil, gas, and geothermal exploration and development activities where contracts and leases do not already exist, unless there are no other options for location and RMOs can be attained and adverse effects to aquatic resources can be avoided. Adjust the operating plans of existing contracts to (1) eliminate impacts that prevent attainment of RMOs and (2) avoid adverse effects to native aquatic species.

A2/AQ-S15. Standard. Permit sand and gravel mining and extraction within RCAs only if no alternatives exist, if the action(s) will not retard or attainment of RMOs, and if adverse effects to native aquatic species can be avoided.

A2/AQ-S16. Standard. Develop inspection, monitoring, and reporting requirements for mineral activities. Evaluate and apply the results of inspection and monitoring to modify mineral plans, leases, or permits as needed to avoid adverse effects on native aquatic species and to eliminate impacts that prevent attainment of RMOs.

A2/AQ-S17. Standard. Design fuel treatment and fire suppression strategies, practices, and actions so as to not prevent attainment of RMOs and to minimize disturbances of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuel management actions could perpetuate or be damaging to long-term ecosystem function or aquatic resources.

A2/AQ-S18. Standard. Locate incident bases, camps, helibases, staging areas, helispots, and other centers for incident activities outside of RCAs. If the only suitable location for such activities is within the RCAs, an exemption may be granted following a review and recommendation by a resource advisor. The advisor would prescribe the location, use conditions, and rehabilitation requirements, with avoidance of adverse effects to aquatic resources a primary goal. Use an interdisciplinary team, including a fishery biologist, to predetermine incident base and helibase locations during pre-suppression planning.

A2/AQ-S19. Standard. Prohibit delivery of chemical retardant, foam, or additives to surface waters. An exception may be warranted in situations where overriding immediate safety imperatives exist, or, following a review and recommendation by a resource advisor and a fishery biologist, when the action agency determines an escaped fire would cause more long-term damage to fish habitats than chemical delivery to surface waters.

A2/AQ-S20. Standard. Prescribed burn projects and prescriptions should be designed to contribute to the attainment of the RMOs.

A2/AQ-S21. Standard. Immediately establish an emergency team to develop a rehabilitation treatment plan to attain RMOs and avoid adverse effects on aquatic resources whenever RCAs are significantly damaged by a wildfire or a prescribed fire is burning out of prescription.

A2/AQ-S22. Standard. For hydroelectric and other surface water development proposals, require instream flows and habitat conditions that maintain or restore riparian resources, favorable channel conditions, and fish passage, reproduction, and growth. Coordinate this process with the appropriate State agencies. During relicensing of hydroelectric projects, provide to the Federal Energy Regulatory Commission (FERC) written and timely license conditions that require fish passage and flows and habitat conditions that maintain/restore

riparian resources and channel integrity. Coordinate relicensing projects with the appropriate State agencies.

A2/AQ-S23. Standard. Locate new hydroelectric ancillary facilities outside RCAs. For existing ancillary facilities inside the RCA that are essential to proper management, provide recommendations to FERC to assure that the facilities would not prevent attainment of the RMOs and that adverse effects on aquatic resources are avoided. Where these objectives cannot be met, provide recommendations to FERC that such ancillary facilities should be relocated. Locate, operate, and maintain hydroelectric facilities that must be located in RCAs to avoid adverse effects on aquatic resources.

A2/AQ-S24. Standard. Issue leases, permits, rights-of-way, and easements to avoid adverse effects on aquatic resources and to avoid effects that would be inconsistent with or prevent attainment of RMOs. Where the authority to do so was retained, adjust existing leases, permits, rights-of-way, and easements to eliminate effects that would retard or prevent attainment of the RMOs or adversely affect aquatic resources. If adjustments are not effective, eliminate the activity. Where the authority to adjust was not retained, negotiate to make changes in existing leases, permits, rights-of-way, and easements to eliminate effects that would prevent attainment of the RMOs or adversely affect aquatic resources. Priority for modifying existing leases, permits, rights-of-way, and easements would be based on the current and potential adverse effects on aquatic resources and the ecological value of the riparian resources affected.

A2/AQ-S25. Standard. Apply herbicides, pesticides, and other toxicants and chemicals in a manner that does not retard or prevent attainment of RMOs and that avoids adverse effects on aquatic resources.

A2/AQ-S26. Standard. Prohibit storage of fuels and other toxicants within RCAs. Prohibit refueling within RCAs unless there are no other alternatives. Refueling sites within RCAs shall be approved by the Forest Service or Bureau of Land Management and have an approved spill containment plan.

A2/AQ-S27. Standard. Locate water drafting sites to avoid adverse effects on aquatic resources and instream flows, and in a manner that does not retard or prevent attainment of RMOs.

A2/AQ-S28. Standard. Design and implement watershed restoration projects in a manner that promotes the long-term ecological integrity of ecosystems, conserves the genetic integrity of native species, and contributes to attainment of RMOs.

A2/AQ-S29. Standard. Design and implement fish and wildlife habitat restoration and enhancement actions in a manner that contributes to attainment of the RMOs.

A2/AQ-S30. Standard. Design, construct, and operate fish and wildlife interpretive and other user-enhancement facilities in a manner that does not retard or prevent attainment of RMOs or adversely affect aquatic resources. For existing fish and wildlife interpretive and other user-enhanced facilities inside RCAs, assure that RMOs are met and adverse effects on aquatic resources are avoided. Where RMOs cannot be met or adverse effects on aquatic resources avoided, relocate or close such facilities.

A2/AQ-S31. Standard. Design, construct, and operate recreation facilities (including trails) and dispersed sites in a manner that does not retard or prevent attainment of RMOs and avoids effects on aquatic resources.

A2/AQ-S32. Standard. Complete ecosystem analysis prior to construction of new recreation facilities in RCAs.

A2/AQ-S33. Standard. For existing recreation facilities inside RCAs, assure that facilities or use of facilities will not prevent attainment of RMOs or adversely affect native aquatic species. Relocate or close recreation facilities where RMOs cannot be met or adverse effects on aquatic resources cannot be avoided.

A2/AQ-S34. Standard. Adjust dispersed and developed recreation practices that retard or prevent attainment of RMOs or adversely affect aquatic resources. Where adjustment measures such as education, use limitations, traffic control devices, increased maintenance, relocation of facilities, and/or specific site closures are not effective in meeting RMOs and avoiding adverse effects on aquatic resources, eliminate the practice or occupancy.

Human Uses and Values

Same direction as Alternative 1.

Implementation, Adaptive Management, and Monitoring

Same direction as Alternative 1.

Alternatives 3 through 7

Objectives and standards for Alternatives 3 through 7 are found in table 3-5. The Ecosystem Management section, which comes first in the table, provides the umbrella for management of Forest Service- and BLM-administered lands in the planning area. Restoration and conservation strategies are integrated within each alternative. A key component of these strategies is use of hierarchical scale relations which includes subbasin scale review and watershed scale analysis to provide context for prioritization of restoration or conservation management.

Landscape Approach

One intent of Alternatives 3 through 7 is to provide direction to manage landscapes to conserve or restore long-term ecological processes and patterns consistent with achieving short-term and long-term aquatic, terrestrial, and socioeconomic objectives. The Science Integration Team's Landscape chapter of the *Assessment of Ecosystem Components* (1996) identified important patterns, processes, and disturbance mechanisms that together provide ecological functions at scales ranging from individual sites to beyond the project area. Cause-and-effect relationships operate at each scale and among scales. These alternatives prescribe planning/analysis processes that are designed to account for these cause-and-effect relationships. The landscape assessment found that taking "no action" (that is, continuing current practices, which suppress disturbances such as fire, insects, disease, or others resulting from active vegetation management) has a stronger influence in adversely affecting long-term landscape outcomes than does taking specific management actions to manage risks to landscape processes. Thus, in each alternative it is intended that managers consider where and when specific actions will be taken, as well as where and when to take no action. Such a consideration can best provide for landscapes with ecological processes, vegetation patterns, and disturbance mechanisms that are consistent with the objectives of the alternatives.

Scale of Analysis

It is intended that ecosystem analysis should be tailored to the issue or situation; ecosystem analysis should not be seen as an identical process or magnitude for every situation.

The scale of ecosystem analysis is determined by considering the type of interactions, processes, and conditions (including known values such as cultural and economic) being affected on the landscape.

For example, on large blocks of rangeland where water is scarce and topography is relatively flat, it is appropriate to use a meaningful and efficient boundary as long as the logic and processes of ecosystem analysis are followed and the product provides context and information for decisions.

Process versus Prescriptive/ Interim versus Permanent Standards

Table 3-5 lists standards that establish or define processes as well as those that set parameters for certain conditions or activities. Standards were developed to meet objectives and provide assurance or reliability that intended actions will be achieved. Process standards (such as EM-S1) are intended to be implemented as stated. For standards that prescribe parameters (such as TE-S2), it is recognized that conditions vary within the EIS (planning) area and that standards have effects at multiple scales and cause interactions or effects with other components of the ecosystem over time across the landscape. Local conditions, ecological attainability, risks, and cause-effect relationships with other ecosystem components may create a need to modify how a manager fulfills the intent of a standard to more effectively meet objectives. Each alternative describes the analysis required to modify non-process ICBEMP standards while providing equal or greater assurance of meeting objectives.

Ecosystem Analysis at the watershed scale (using the related six-step logic process, as described in the *Federal Guide for Watershed Analysis*) is the method of analyzing conditions,

The User's Guide at the end of this chapter provides a step-by-step process to assist in understanding the alternatives.

trends, issues, risks, and interactions. This process is tiered to assessments and decisions at other scales and is done collaboratively with interagency and other involvement. Based on this process, there may be needs or opportunities to modify the application of standards to more effectively meet objectives at the local level. Results would be documented through NEPA processes.

Interpretation of Activity Tables

Activity tables (tables 3-6 and 3-7) were developed for each forest and range cluster by alternative to aid in analysis of effects, to allow projection of outcomes if the various alternatives were to be implemented, and to indicate relative differences among alternatives. *The activity levels are not targets or allocations.* They are predicted activities, expressed in ranges of numbers, which focus on areas of treatment as opposed to traditional outputs such as timber volume or grazing animal unit months. Objectives depend on Tables 3-6 and 3-7 to differentiate management activity rate, location, and priority among Alternatives 3 through 7. The activities displayed in Tables 3-6 and 3-7 are the active methods that are most often anticipated and associated with restoration of ecological function and processes. A more complete explanation of how the numbers were derived and what is meant by the various activities can be found in Appendix L in the section entitled "Ruleset".

Roads Standards

The roads standards (RM-O1 - RM-O4, RM-S1 - RM-S15) acknowledge the needs for roads for management purposes and public use. The standards are designed, however, to also address findings in the *Scientific Assessment* (Quigley and Arbelbide 1996) related to adverse effects on aquatic and terrestrial habitat. Reducing these impacts to aquatic and terrestrial habitat may cause additional effects to other ecosystem components over time. These cause-effect relationships should be explored and analyzed during ecosystem analysis at the watershed scale and/or in project NEPA analysis. Management activities should reflect an understanding of these relationships over time aeross the landscape.

Reducing road-related adverse effects will be guided by information and tables in the Rule Set that display forest and range cluster road density reduction priorities, results of the Road Risk Inventory, the need to meet RMOs and terrestrial objectives, and the need to improve overall ecological integrity. In setting priorities and implementing management actions, cause-effect relationships with other ecosystem components including ecological integrity will be considered across the landscape over time. With the extent of the existing road network and the variety of needs, uses, and impacts, actions to reduce adverse impacts will focus on areas or situations where risks are highest.

Relationship of Alternatives 1 and 2 to Table 3-5

Table 3-5 elaborates on Alternatives 3 through 7 but also includes reference to the previous pages of this chapter in which Alternatives 1 and 2 are summarized. Information for Alternatives 1 and 2 is abbreviated in Table 3-5 because the many individual Forest Service and BLM land-use plans and framework documents are written at a more detailed scale than is appropriate for this project. Direction from those plans was generalized and consolidated into objectives, standards, and guidelines that are representative of existing plans at the broad scale to provide a point of comparison for Alternatives 3 through 7. Wherever possible, Table 3-5 refers to the corresponding objectives, standards, and/or guidelines from Alternatives 1 and 2, presented on the previous pages, in order to facilitate comparison among all alternatives. See the introduction to Chapter 3 for further discussion of current direction and the development of alternatives.

Navigating Table 3-5

An index to Table 3-5 immediately precedes table 3-5 to facilitate finding objectives and standards of interest. A User's Guide to the Action Alternatives follows the Comparison of Alternatives section and provides detailed information on the construction of the alternatives.

Index to Objectives and Standards in Table 3-5

Implementing Ecosystem Management

EM-O1 **Implement ICBEMP using multi-scaled hierarchical analysis**
EM-O2 **Implement ICBEMP using collaborative intergovernmental approach**

Sub-basin Review

EM-O3 **Conduct brief sub-basin reviews**

EM-S1	Complete sub-basin reviews within 1-3 years
EM-S2	Things to consider during sub-basin review
EM-S3	Collaborative, interagency sub-basin review shall prioritize EAWS
EM-S4	Use sub-basin review for EAWS and land use plan revisions

Ecosystem Analysis at the Watershed Scale

EM-O4 **Conduct ecosystem analysis at the watershed scale (EAWS)**

EM-S5	Federal Guide for EAWS shall be used
EM-S6	Line officers shall set the scope of EAWS
EM-S7	Category 1 sub-basins EAWS "trigger"
EM-S8	Listed, Proposed, Candidate species EAWS "trigger"
EM-S9	Low road density EAWS "trigger"
EM-S10	Large blocks of native rangeland EAWS "trigger"
EM-S11	Screening process to exempt activities from EAWS
EM-S12	Four-year transition period in Category 2 and 3 sub-basins
EM-S13	Restrictions on modifying standards, including RMOs and RCAs
EM-S14	Use EAWS to provide context for land management activities

Physical Environment

Soil Productivity

PE-O1 **Maintain soil productivity**
PE-O2 **Maintain riparian soils to ensure high quality water**
PE-O3 **Develop soil productivity protection and restoration programs**
PE-O4 **Restore and maintain nutrient cycling**

PE-S1	Recommendations for managing coarse woody debris
PE-S2	Recommendations for amounts of coarse woody debris after wildfire
PE-S3	Recommendations for large diameter standing live and/or dead wood

Air Quality

PE-O5 **Protect air quality/comply with Clean Air Act requirements**

PE-S4	Assess management activities that may affect air quality

Terrestrial Strategies

TS-O1 **Maintain and promote native plant communities**

TS-S1	Maintain or improve native plant communities

Fire Disturbance Processes

TS-O2 **Restore fire as natural disturbance process**
TS-O3 **Rehabilitate disturbed areas**

TS-S2	Rehabilitate/revegetate disturbed areas with ecologically appropriate species
TS-S3	Use native species in rehabilitation seedings
TS-S4	Rest burned areas from grazing to maintain soil productivity

Index to Objectives and Standards in Table 3-5 (continued)

Noxious Weeds

TS-O4 **Manage noxious weeds across jurisdictional/political boundaries**
- TS-S5 Implement IWM strategy/ 7 steps of strategy
- TS-S6 Implement IWM strategy on forest lands

TS-O5 **Implement IWM strategy on rangelands**
- TS-S7 Implement steps of IWM strategy, Range Clusters 2 (alts 3,4,&7 outside); 2 and 4 (alt 5); and 2,3,&5 (alt 6)
- TS-S8 Implement steps IWM strategy, Range Clusters 3 (alts 3 & 5); and 1,3,4, 5& 6 (alt 4)
- TS-S9 Implement steps IWM strategy, Range Cluster 5 (alt 3 & 5)
- TS-S10 Implement steps IWM strategy, Range Clusters 1,4,&6 (alt 3&7 outside); 1&6 (alt 5); 1,3,4,5,&6 (alt 6)

Forestlands

Dry Forest

TS-O6 **Restore ecosystem processes /Dry Forest**
- TS-S11 Increase ppine and wlarch in mature/old single & multi-story forests
- TS-S12 No harvest of dominant or co-dominant ppine outside reserves
- TS-S13 No silvicultural treatments in mature/old forests outside reserves
- TS-S14 No commercial harvest in dry forest terrestrial reserves

TS-O7 **Manage suitable lands to produce commodities/maintain ecosystem**

Moist Forest

TS-O8 **Restore ecosystem processes /Moist Forest**
- TS-S15 Maintain viability of and increase western white pine
- TS-S16 Plant blister-rust-resistant stock/increase western white pine
- TS-S17 Increase dominance of early successional, shade-intolerant species
- TS-S18 No harvest of dominant or co-dominant ppine outside reserves
- TS-S19 No silvicultural treatments in mature/old forests outside reserves
- TS-S20 No commercial harvest in moist forest terrestrial reserves

TS-O9 **Manage suitable lands to produce commodities/maintain ecosystem**

Cold Forest

TS-O10 **Restore ecosystem processes /Cold Forest**
- TS-S21 Maintain viability of/increase whitebark pine and subalpine larch

TS-O11 **Manage suitable lands to produce commodities/maintain ecosystem**

Rangelands

TS-O12 **Restore or maintain rangeland health**
- TS-S22 Implement strategies to maintain/restore watershed function
- TS-S23 On dry shrublands, manage grazing during/after drought years

TS-O13 **Produce livestock forage while restoring ground cover and productivity**

TS-O14 **Reduce encroachment of junipr, conifers, and sagebrush**

TS-O15 **Restore dry grass/dry shrub/cool shrub**
- TS-S24 No livestock grazing in reserves
- TS-S25 No range improvement projects in reserves

TS-O16 **Produce livestock forage and conserve cool shrub/dry shrub/dry grass**

Aquatic / Riparian Strategies

AQ-O1 **Emphasize riparian and aquatic processes and functions**

AQ-O2 **Maintain high quality aquatic and riparian habitat**

AQ-O3 **Protect high quality waters and identify and maintain habitats**

AQ-O4 **Category 1 sub-basins: Maintain watersheds**

AQ-O5 **Restore watersheds where they have been degraded**

AQ-O6 **Implement watershed restoration activities based on priorities**

Index to Objectives and Standards in Table 3-5 (continued)

AQ-O7 **Category 2 sub-basins: Maintain strongholds and restore watersheds**
AQ-O8 **Timber and livestock priority areas: Conserve species strongholds**
AQ-O9 **Category 3 sub-basins: Maintain strongholds**
AQ-O10 **Manage riparian vegetation consistent with site potential**

Watershed and Riparian Restoration

AQ-S1 Watershed restoration projects to promote long-term ecological integrity
AQ-S2 Attain PFC as a first step
AQ-S3 Develop watershed plans for instream structures and road obliteration/reconstruction
AQ-S4 Offset new sediment-producing activities with sediment abatement
AQ-S5 Design fish/wildlife habitat restoration/enhancement to attain RMOs

Timber Management

AQ-S6 Forest vegetation management in RCAs
AQ-S7 Zone 1 - management to achieve or maintain characteristic stream/valley conditions
AQ-S8 Zone 2a - manage as buffer to Zone 1
AQ-S9 Zone 1 and 2a - not included in suitable timber base
AQ-S10 Zone 2b - manage as additional buffer to Zones 1 and 2a

Grazing Management

AQ-S11 Priorities for revising AMPs based on sub-basin reviews
AQ-S12 Attaining PFC and RMOs
AQ-S13 Limit handling efforts to not prevent attainment of RMOs
AQ-S14 New livestock handling facilities to be located outside RCAs
AQ-S15 No livestock grazing in RCAs in or adjacent to designated critical habitat
AQ-S16 Suspend grazing where riparian protection can't be implemented
AQ-S17 Adjust wild horse management to avoid impacts to RMOs/aquatic resources

Minerals Management

AQ-S18 Locatable minerals - Avoid or minimize adverse impacts to aquatic resources
AQ-S19 Locate structures outside of RCAs where practicable
AQ-S20 Mine wastes and toxic chemicals
AQ-S21 Leasable minerals - No surface occupancy in RCAs
AQ-S22 Restrictions on sand and gravel extraction within RCAs
AQ-S23 Develop inspection, monitoring, and reporting requirements

Recreation Management

AQ-S24 Prevent or minimize adverse effects to from recreation facilities in RCAs
AQ-S25 Design recreation facilities to not retard/prevent attainment of RMOs
AQ-S26 Existing recreation facilities in RCAs to not prevent attainment of RMOs
AQ-S27 Fish/wildlife user facilities to not prevent attainment of RMOs
AQ-S28 Adjust recreation practices that retard or prevent attainment of RMOs

Fire Suppression/Fuels Management

AQ-S29 Fuel treatment/fire suppression to not prevent attainment of RMOs
AQ-S30 Fire suppression activities restrictions in RCAs
AQ-S31 Locate centers for fire incident activities outside of RCAs
AQ-S32 Prohibit delivery of chemicals to surface waters
AQ-S33 Prescribed burns/prescriptions consistent with attainment of RMOs
AQ-S34 Prohibit backfire operations that increase fire intensities in RCAs
AQ-S35 Establish team to develop rehab plan to attain RMOs

Lands/Permits/Facilities

AQ-S36 For hydro projects, require instream flows to maintain resources
AQ-S37 Complete EAWS prior to issuing water conveyance permits
AQ-S38 Determine/establish instream flow requirements for species needs
AQ-S39 Revoke conveyance permits for those without state water rights

Index to Objectives and Standards in Table 3-5 (continued)

	AQ-S40	All water conveyance intakes shall meet established standards
	AQ-S41	Conveyance permits require best methodology to conserve water
	AQ-S42	Hydroelectric ancillary facilities to not prevent attainment of RMOs
	AQ-S43	New developments that may adversely affect RCAs not permitted
	AQ-S44	Leases, permits, etc., to avoid effects inconsistent with attainment of RMOs

Additional Riparian Management

	AQ-S45	Eliminate or reduce risks from transport of toxic chemicals
	AQ-S46	Develop contingency plans for chemical spills or contamination
	AQ-S47	Herbicides etc. to not retard or prevent attainment of RMOs
	AQ-S48	Prohibit storage of fuels and toxicants within RCAs
	AQ-S49	Locate water drafting sites to avoid adverse effects on aquatics
AQ-O11	**Manage grazing in wetlands to prevent impairment of functions**	
AQ-O12	**Minimize disturbance to redds for candidate & sensitive species**	
	AQ-S50	Manage livestock to prevent disturbance to redds for T,E,P species
	AQ-S51	Manage livestock to minimize impacts on redds for C & S species

Water Quality

AQ-O13	**Maintain and improve water quality**	
	AQ-S52	Maintain water quality in Outstanding Resource Waters
	AQ-S53	Comply with state or tribal anti-degradation requirements
	AQ-S54	Comply with TMDLs in Water Quality Limited segments
	AQ-S55	Incorporate state WQLS priority lists into intergovernmental prioritization process
	AQ-S56	Adjust activities to meet water quality standards
AQ-O14	**Develop management actions supported by EAWS to restore WQLS**	

Terrestrial and Aquatic Species and Habitats

HA-O1	**Restore and/or maintain and habitat conditions**	

Viable populations

HA-O2	**Provide habitat for viable populations, recovery of listed spp, social needs**	
	HA-S1	Manage habitats for long-term viability, especially edge of range
	HA-S2	Management to restore vegetation composition, linkage, patch size
	HA-S3	Restore/maintain habitats for free movement between habitat blocks
	HA-S4	Improve/restore linkages at known habitat bottlenecks
	HA-S5	Develop mature/old forest structural definitions
	HA-S6	Analysis and strategies for mature/old structure stands
	HA-S7	Use local analysis to develop snag levels
	HA-S8	Use local analysis to develop downed wood levels
	HA-S9	Manage firewood programs consistent with snag and downed wood standards
	HA-S10	Restore mountain mahogany, bitterbrush, quaking aspen
	HA-S11	Restore native plants on important wild ungulate winter range
	HA-S12	Protect bat roost sites and hibernacula

Protection/Restoration of Listed Species Habitats

HA-O3	**Restore or protect habitat for listed species; manage habitat to prevent listing**	
	HA-S13	Manage habitats to recover special status species, prevent listings
HA-O4	**Manage rangelands for special status species habitat requirements**	
HA-O5	**Provide for continued existence and long-term conservation of species**	

Recovery of Federally Listed Aquatic and Terrestrial Species

HA-O6	**Contribute to range-wide recovery of federally listed or proposed species**	
	HA-S14	Implement recovery plans, document departures
	HA-S15	Apply standards & guides from recovery documents for raptors
	HA-S16	Adopt IGBC grizzly bear resource management guidelines/situations

Index to Objectives and Standards in Table 3-5 (continued)

Index to Objectives and Standards in Table 3-5 (continued)

	TI-S4	Cooperate with tribes to restore/research treaty/trust resources
TI-O2		**Assess sense of place and incorporate into management**
	TI-S5	Complete place assessments as part of ecosystem analysis

Habitat Conditions

TI-O3	**Recognize native plant communities as traditional resources**	
	TI-S6	Establish programs for restoration/maintenance of native plant communities
	TI-S7	Provide habitat conditions to support harvestable resources
	TI-S8	Consider protection/restoration of treaty resources on ceded lands
	TI-S9	Assess habitat where it has social/ traditional importance
	TI-S10	Adopt aquatic conservation strategy
	TI-S11	Least restrictions on tribes to implement ESA conservation measures

Road Management

RM-O1 **Cooperate with partners on road design, operations, maintenance**

Road-related Adverse Effects

RM-O2	**Reduce road-related adverse effects**	
	RM-S1	Reduce road-related adverse effects
	RM-S2	Timber and livestock priority areas: management actions to not increase erosion, sediment
	RM-S3	Conduct Road Condition/Risk Assessment
	RM-S4	Develop or revise Access and Travel management plans
	RM-S5	Reduce effects on aquatic, riparian, terrestral species and habitats
	RM-S6	Determine habitat effectiveness ratings to reduce risk caused by human access
	RM-S7	Design and improve culverts to accommodate 100-year floods

Road Density

RM-O3	**Reduce road density where roads have adverse effects**	
	RM-S8	Decrease road miles in High and Extreme road density classes
	RM-S9	Use existing transportation networks in High & Extreme classes

Road Construction

RM-O4	**New road construction to prevent or minimize adverse effects**	
	RM-S10	Roads and landings should be outside RCAs
	RM-S11	Timber and livestock priority areas: no roads within 150' of active channel margins
	RM-S12	Maintain/restore fish passage, spawning, etc.
	RM-S13	Avoid high hazard areas, prevent sediment delivery to streams and RCAs
	RM-S14	Prohibit side casting in RCAs
	RM-S15	Don't increase road density by more than one density class in areas with none/low/ very low road densities
	RM-S16	No road construction in reserves or unroaded areas > 1,000 acres

Adaptive Management / Monitoring

Adaptive Management

AM-O1	**Make appropriate adjustments in management strategies**	
	AM-S1	Use adaptive management principles
	AM-S2	Adjustments to 'reserve' boundaries

Index to Objectives and Standards in Table 3-5 (continued)

Monitoring

AM-O2 Monitor changes in conditions and take action to meet ecosystem managment goals

AM-S3	Develop integrated intergovernmental monitoring and evaluation protocol
AM-S4	Implement annual monitoring programs at various scales
AM-S5	Critical monitoring shall be implemented immediately
AM-S6	Update riparian monitoring within grazing allotments
AM-S7	Use monitoring to modify management actions to achieve objectives

Accountability

A-O1 Line officers are accountable for implementation

A-S1	State Directors/Regional Foresters ensure accountability
A-S2	Develop interagency implementation MOU
A-S3	Provide opportunities for participation in implementation oversight
A-S4	Implement accountable, measurable standards

Table 3-5. Objectives and Standards

Implementing Ecosystem Management

Alternative 1	Alternative 2	Alternative 3 / Alternative 4 / Alternative 5 / Alternative 6 / Alternative 7
EM-O1. Objective: Not applicable.	**EM-O1. Objective:** Not applicable.	**EM-O1. Objective:** Implement Interior Columbia Basin Ecosystem Management Project (ICBEMP) plan objectives, standards, and guidelines for tribal rights and interests and terrestrial, riparian, aquatic, social, and economic systems using multi-scaled, hierarchical (in time and space) analysis methods as appropriate. ***Rationale:*** *ICBEMP broad-scale direction is most appropriately implemented at finer scales using hierarchical ecosystem analysis. Ecosystem analysis is not a decision-making process; it is a context-setting process for management. The ICBEMP EISs generally provide broad- and mid-scale ecosystem information and management direction. Scale is characterized by both resolution of detail and geographic extent; the finer the detail, the finer the scale. Detail influences the geographic extent of scale. Broad-scale includes the entire ICBEMP area, or the Eastside or Upper Columbia River Basin planning areas. Mid-scale includes Ecological Reporting Units (ERUs), or clusters (groups of 4th-field HUCs, not always contiguous) and sometimes sub-basins (4th-field HUCs.) Scales are approximate and dynamic. Ideally the scale receiving analysis would be nested into the context of at least one larger and one smaller scale.*
EM-O2. Objective: Not applicable.	**EM-O2. Objective:** Not applicable.	**EM-O2. Objective:** Implement the ICBEMP plans using a collaborative intergovernmental approach. ***Rationale:*** *The intent of this objective is to create an avenue for resolving issues that, while of concern at this broad scale, are better resolved at the local level. The process is not greatly different than the current approach, except that additional emphasis is placed on managers and interdisciplinary team leaders to: notify affected agencies as early as possible of issues needing resolution; provide opportunities for participation; and set reasonable deadlines. Forest Service and/or BLM Line officers still retain final decision-making authority. It is believed that land management decisions that include collaborative involvement from other federal, state, local, and tribal organizations are more likely to withstand legal challenge and thereby provide greater assurance of sustainable activity levels.*

Subbasin Reviews

EM-O3. Objective: Not applicable.	**EM-O3. Objective:** Not applicable.	**EM-O3. Objective:** Conduct subbasin reviews at the subbasin (4th-field HUC, approximately 800,000 - 1,000,000 acres) or basin (contiguous groups of 4th-field HUCs) scale as an initial step of UCRB plan implementation. Subbasin review is intended to be a brief two- to three-week validation process in which broad-scale information from the *Scientific Assessment* and existing finer-scale data from BLM District and National Forest offices are tiered to ICBEMP goals, objectives, and standards. ***Rationale:*** *The purpose of subbasin review is to identify opportunities and establish priorities for vegetation, prescribed fire, aquatic, riparian, terrestrial, recreation, and watershed management at the subbasin or basin scale. Just as the* Scientific Assessment *provides the context for subbasin review, results from the subbasin review will provide the context for ecosystem analysis at the finer watershed (5th-field HUC) and subwatershed (6th-field HUC) scale.*

Implementing Ecosystem Management

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
EM-S1. Standard: Not applicable.	**EM-S1. Standard:** Not applicable.	**EM-S1. Standard:** Subbasin reviews shall be conducted on all Forest Service- and BLM-administered lands in the project area in the first three years after the ROD is signed, accomplishing 1/3 in the first year, 1/3 in the second year, and 1/3 in the third year. These reviews shall be a brief validation and shall meet the intent of Objective EM-O3. Management activities can proceed only in areas where subbasin review is completed or where subbasin review is not scheduled for completion in the current year. Existing information from all appropriate sources, including tribes, counties, states, etc. shall be used.			**EM-S1. Standard:** Subbasin reviews shall be conducted on all Forest Service- and BLM-administered lands in the project area in the first year after the ROD is signed. These reviews shall be a brief validation and shall meet the intent of Objective EM-O3. During the one-year transition period, projects can proceed without subbasin review. Existing information from all appropriate sources, including tribes, counties, states, etc. shall be used.	**EM-S1. Standard:** ***Inside reserves:*** Subbasin review shall be conducted prior to initiating management activities. Existing infor-mation from all appropriate sources, including tribes, counties, states, etc. shall be used. ***Outside reserves:*** Same as Alternative 3.

Rationale: *Subbasin review is intended to be brief (two to three weeks) and make use of existing information. It is not a decision process nor an analysis process. The purpose is to:*

- *Review information provided in the* Scientific Assessment *and from the spatial prioritization process and validate with existing local information.*
- *Provide an initial step in the hierarchical decision process from broad to fine scale.*
- *Prioritize opportunities for ecosystem analysis within the subbasin.*
- *Identify potential project level opportunities for implementing ecosystem management that can be determined at this scale.*
- *Identify data gaps.*
- *Identify opportunities for pooling interagency (federal agencies), tribal, and intergovernmental (states, counties, cities) resources for completing analyses and project-level work.*

Alternative 1	Alternative 2	Alternatives 3–7
EM-S2. Standard: Not applicable.	**EM-S2. Standard:** Not applicable.	**EM-S2. Standard:** When conducting subbasin review and subsequent finer-scaled analyses, tribal, socio-economic, and biophysical resources (watershed, terrestrial, and aquatic) information and processes shall be considered, as appropriate to the scale, management objectives, and intergovernmental prioritization schedule described in Standard EM-S3. Examples to consider in the subbasin review can be found in the Implementation Appendix (Appendix I).

EM-S3. Standard: Not applicable.	**EM-S3. Standard:** Not applicable.	**EM-S3. Standard:** As part of the collaborative intergovernmental subbasin review, a prioritization schedule for completion of Ecosystem Analysis at the Watershed (5th- or 6th-field HUCs) Scale shall be developed with input or participation from affected federal, tribal, state, and local governments. (See also Standard EM-S12.)
EM-S4. Standard: Not applicable.	**EM-S4. Standard:** Not applicable.	**EM-S4. Standard:** Information from subbasin reviews, when available, shall be used to provide context for subsequent 5th- or 6th-field HUC ecosystem analysis and for Forest Service and BLM land use plan revisions. ***Rationale:*** *It is intended that ecosystem analysis should be tailored to the issue/situation (it should not be seen as an identical magnitude or process for every situation). Ecosystem analysis considers the type of interactions, processes, and conditions on the landscape being affected, thereby determining the scale of the analysis. Conditions to be considered include known values such as cultural and economic values. On rangelands (for instance where water is scarce and topography is relatively flat) it is appropriate to use a meaningful and efficient boundary as long as the logic and processes of ecosystem analysis are followed and the product provides context and information for decisions.*

Ecosystem Analysis at the Watershed Scale

EM-O4. Objective: Not applicable.	**EM-O4. Objective:** Not applicable.	**EM-O4. Objective:** Conduct Ecosystem Analysis at the Watershed Scale (5th- or 6th-field HUCs, approximately 10,000 to 100,000 acres) to provide context and focus for fine-scale project planning, design, and implementation within the project area. To do so, use the following items: - broad-level analysis provided by the Scientific Assessment, - spatial prioritization provided in the ICBEMP Final EISs, and - results of the subbasin review. ***Rationale:*** *The watershed scale is a key layer in ecosystem analysis and planning. Where management actions could have a watershed-scale effect, Ecosystem Analysis at the Watershed Scale should be used to assure potential actions are evaluated with an overall understanding of the capabilities and limitations of specific watersheds. Information gained through analysis at this fine scale will be vital to adaptive management of broad physiographic regions, and can support land management plan revisions and development of ecologically sustainable programs and projects.* *Situations likely to have watershed-scale effects could include, but are not limited to, the following:* - *a major road crossing with probable downstream effects,* - *multiple large openings with probable downstream effects,* - *single openings affecting a small but significant area, with no downstream effect,* - *changes in habitat patterns or corridors, and* - *changes in risks of natural disturbance such as fire, insects, or disease.*
Not Applicable.	See Standards A2/AQ-S1, A2/AQ-S3, and A2/AQS4 which require Ecosystem Analysis under Alternative 2.	***Ecosystem Analysis at the Watershed Scale Summary:*** Ecosystem Analysis at the Watershed Scale must be completed prior to conducting activities in areas covered by standards EM-S7 (Category 1 sub-basins), EM-S8 (habitat for listed and some other species), EM-S9 (areas with low road densities), or EM-S10 (large blocks of native rangelands). EM-S7 applies to Alternatives 3 through 7. EM-S8 has three variations: Alternative 3; Alternatives 4, 5 (outside timber and livestock priority areas), and 7; and Alternative 6. EM-S9 applies to Alternatives 6 and 7. EM-S10 applies to Alternative 6. In areas not covered by those standards, activities can occur without Ecosystem Analysis during a 4-year transition period for Alternative 6, or during the life of the plan for Alternatives 3, 4, 5, and 7. After the transition period for Alternative 6, Ecosystem Analysis must be conducted everywhere in the project area prior to initiating activities. (Activities are defined here as management activities that normally require an environmental assessment or environmental impact statement.) Standards AQ-S6, AQ-S35, and AQ-S37 also require Ecosystem Analysis under Alternative 7.

IMPLEMENTING ECOSYSTEM MANAGEMENT

ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7
EM-S5. Standard: Not applicable.	**EM-S5. Standard:** Not applicable.	**EM-S5. Standard:** *Ecosystem Analysis at the Watershed Scale, Federal Guide for Watershed Analysis*, version 2.2 and Forest Service/BLM policy implementation guides (and successors) shall be used when conducting Ecosystem Analysis. Version 2.2 of the *Federal Guide* provides the process for conducting Ecosystem Analysis. The degree and extent should vary by the complexity, risks, and objectives within subwatersheds. Existing information from all appropriate sources should be used to meet or augment needs described in the *Federal Guide*.				
EM-S6. Standard: Not applicable.	**EM-S6. Standard:** Not applicable.	**EM-S6. Standard:** Line officers shall set the scope of Ecosystem Analysis based on issues, objectives, and availability of personnel, time, and funds.				
EM-S7. Standard: Not applicable.	**EM-S7. Standard:** Not applicable.	**EM-S7. Standard:** In Category 1 sub-basins, Ecosystem Analysis at the Watershed Scale shall be completed prior to any activity that requires an environmental assessment or environmental impact statement. (See also EM-O4 and AQ-O3.) The requirement for Ecosystem Analysis in Category 1 sub-basins applies only to activities outside congressionally designated wilderness areas and human-ignited prescribed fires within wilderness areas. (See also Standard EM-S11.)				
EM-S8. Standard: Not applicable.	**EM-S8. Standard:** Not applicable.	**EM-S8. Standard:** Ecosystem Analysis at the Watershed Scale shall be performed prior to any activity that requires an environmental assessment or environmental impact statement in the following areas: - stronghold subwatersheds, - bull trout fringe subwatersheds, - subwatersheds containing wild populations of steelhead or ocean- or stream-type chinook salmon, or - Snake River salmon or bull trout High Priority Watersheds. See EM-S11, EM-S12, and EM-S13 for further direction.	**EM-S8. Standard:** Ecosystem Analysis at the Watershed Scale shall be completed prior to any activity that requires an environmental assessment or environmental impact statement in subwatersheds that would affect: - federally listed and proposed species or their habitats, or - recently occupied (within the past 20 years) or currently accessible habitat of federally listed and proposed fish species, or - populations of steelhead or ocean- or stream-type chinook salmon. (See also EM-S11.)	**EM-S8. Standard:** ***Inside timber and livestock priority areas:*** Not applicable. ***Outside timber and livestock priority areas:*** Same as Alternative 4.	**EM-S8. Standard:** Ecosystem Analysis at the Watershed Scale shall be completed prior to any activity that requires an environmental assessment or environmental impact statement in subwatersheds that would affect: - federally listed, proposed, or candidate species or their habitats, - recently occupied (within the past 20 years) or currently accessible habitat of federally listed, proposed, or candidate fish species, or - strongholds and fringe populations of redband trout, westslope cutthroat, or Yellowstone cutthroat trout. (See also EM-S11.)	**EM-S8. Standard:** Same as Alternative 4.

			EM-S8. ***Rationale:*** *The distribution or presence of threatened, endangered, candidate, or proposed species and their habitats does not automatically require Ecosystem Analysis at the Watershed Scale. Rather, it is the effects of proposed activities on these species and their habitats that determine the need for Ecosystem Analysis. Proposed activities in subwatersheds that would not affect a threatened, endangered, candidate, or proposed species or its habitat would not require Ecosystem Analysis. Proposed activities with either positive or adverse effects would require Ecosystem Analysis. The process for determining effects would likely be similar to that used for a "may affect" determination under the Endangered Species Act consultation process.*	
EM-S9. Standard: Not applicable.	**EM-S9. Standard:** Not applicable.	**EM-S9. Standard:** Not applicable. (See also RM-S15.)	**EM-S9. Standard:** To maintain high quality habitats, no net increase in road density shall occur in subwatersheds with road densities less than 0.7 miles/square mile unless Ecosystem Analysis at the Watershed Scale is completed and NEPA analysis demonstrates that aquatic, terrestrial, and other relevant objectives will be met given full consideration of cumulative effects. (See also EM-S11.) ***Rationale:*** *The Science Integration Team found a relationship between low road density and high quality habitats. Roads can increase disturbance, displacement, and direct and indirect mortality to fish and wildlife. Road networks can alter watershed integrity, hydrologic function, sediment regimes, and human use patterns which can not be entirely mitigated.*	
EM-S10. Standard: Not applicable.	**EM-S10. Standard:** Not applicable.	**EM-S10. Standard:** Not applicable.	**EM-S10. Standard:** Ecosystem Analysis at the Watershed Scale shall be completed prior to activities that require an environmental assessment or environmental impact statement and that significantly modify large blocks of existing native rangeland plant communities that are mostly intact and have ecological processes functioning at or near their natural potential. (See also EM-S11.)	**EM-S10. Standard:** Not applicable.

Implementing Ecosystem Management

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
					EM-S10. ***Rationale:*** *The intent of this standard is to maintain intact native rangeland plant communities at multiple scales. Native rangeland communities that are mostly intact generally include the following: 1) areas with average annual rainfall of greater than 12 inches, 2) have a predominance of native vegetation recognizing that some non-native and exotic species may be present, 3) contain a diverse variety of native plant forms, and 4) whose ecological processes (including hydrologic cycle, nutrient cycle, and energy flow) are functioning properly and are capable of supporting healthy biotic communities.*	
EM-S11. Standard: Not applicable.	**EM-S11. Standard:** Not applicable.	**EM-S11. Standard:** Use the screening process to be developed by the Interior Columbia Basin (ICB) intergovernmental team to determine which land management activities that require an environmental assessment or environmental impact statement are exempt from Ecosystem Analysis at the Watershed Scale. (See also EM-S7, EM-S8, EM-S9, and EM-S10.) ***Rationale:*** *There are land management activities that have little impact on resource issues and therefore require no information support from Ecosystem Analysis at the Watershed Scale. The intent of this standard is to develop and use a process to screen these types of activities and exempt them from the Ecosystem Analysis process.*				

EM-S12. Standard: Not applicable.	**EM-S12. Standard:** Not applicable.	**EM-S12. Standard:** Ecosystem Analysis at the Watershed Scale is not required in Category 2 and 3 sub-basins prior to conducting activities unless otherwise required by EM-S8. (See also EM-S13 and the introduction to Table 3-5.) **EM-S12.** ***Rationale:*** *It is the BLM's and Forest Service's intent to complete Ecosystem Analysis within three years for Alternative 3. Recognizing uncertainty with budgets and personnel, an intergovernmental team would assist in setting priorities for Ecosystem Analysis and restoration as described in EM-S3 that would ensure that ICBEMP objectives are met within appropriated budget levels.*			**EM-S12. Standard:** In Category 2 and 3 sub-basins, activities that require an environmental assessment or environmental impact statement shall have a four-year transition period before Ecosystem Analysis at the Watershed Scale is required, unless such analysis is otherwise required by EM-S8, EM-S9, or EM-S10. ***During the transition period,*** information from subbasin review, when available, shall be used to support design and implementation of those activities that do not require Ecosystem Analysis at the Watershed Scale. ***After the transition period,*** Ecosystem Analysis at the Watershed Scale shall be completed on all lands administered by the Forest Service or BLM prior to any activity that requires an environmental assessment or environmental impact statement unless exempted under EM-S11. (See also EM-S13.)	**EM-S12. Standard:** Ecosystem Analysis at the Watershed Scale is not required in Category 2 and 3 sub-basins prior to conducting activities unless otherwise required by EM-S8 or EM-S9. (See also EM-S13 and the introduction to Table 3-5.)

Implementing Ecosystem Management

Alternative 1

EM-S13. Standard: Not applicable.

Alternative 2

EM-S13. Standard: Not applicable.

Alternative 3

EM-S13. Standard: ICBEMP standards (including RMO values and RCA boundaries in Appendix G) can be changed only after conducting Ecosystem Analysis at the Watershed Scale. That is, they cannot be changed through site-specific NEPA analysis unless Ecosystem Analysis at the Watershed Scale has been completed first. (See also introduction to Table 3-5 and EM-S12.) In all cases, rationale for using or modifying RMO values or RCA boundaries shall be documented in the appropriate NEPA document (categorical exclusion, environmental assessment, or environmental impact statement).

Rationale: *Ecosystem Analysis provides the context or "perspective" for site-specific NEPA analysis. Ecosystem Analysis can aid in defining the capabilities and limitations of the watershed, which can then support adjustment to ICBEMP standards, to more appropriately and accurately meet the intent of restoring or maintaining ecosystem function. For example, information from Ecosystem Analysis can support adjustments to RMOs and RCAs.*

Alternative 4

Alternative 5

EM-S13. Standard: ***Inside timber and livestock priority areas:*** Site-specific NEPA analysis and subbasin review, where available, can be used to adjust ICBEMP standards (including RMO values and RCA boundaries) in areas where Ecosystem Analysis at the Watershed Scale is not required, so long as the following conditions are met:
(1) modifications to ICBEMP standards shall provide equal or greater achievement of associated objectives;
(2) full consideration of cumulative effects shall be made;
(3) the rationale for adjustment is documented in environmental assessments or environmental impact statements; and
(4) an opportunity for intergovernmental participation is provided.

Outside timber and livestock priority areas: Same as Alternative 3.

Alternative 6

EM-S13. Standard: ***During the four-year transition period,*** site-specific NEPA analysis and subbasin review, where available, can be used to adjust ICBEMP standards (including RMO values and RCA boundaries) in areas where Ecosystem Analysis at the Watershed Scale is not required, so long as the following conditions are met:
(1) modifications to ICBEMP standards shall provide equal or greater achievement of associated objectives;
(2) full consideration of cumulative effects shall be made;
(3) the rationale for adjustment is documented in environmental assessments or environmental impact statements; and
(4) an opportunity for intergovernmental participation is provided.
After the four-year transition period, modifications to ICBEMP standards can be made only after conducting Ecosystem Analysis at the Watershed Scale. (See also introduction to Table 3-5 and EM-S12.)

Alternative 7

EM-S13. Standard: Same as Alternative 3.

			RM-S13. Standard (cont): ***During and after the four-year transition period,*** rationale for using or modifying RMO values or RCA boundaries shall be documented in the appropriate NEPA document (categorical exclusion, environmental assessment, or environmental impact statement).
EM-S14. Standard: Not applicable.	**EM-S14. Standard:** A2/AQ-S3	**EM-S14. Standard:** After Ecosystem Analysis has been completed at the watershed scale, the information shall be used to provide context and support for land management activities. (See also Rationale for EM-O4.)	

Physical Environment

Soil Productivity

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
PE-O1. Objective: Varies. See: A1/PE-O1 A1/PE-O2 A1/PE-O3	**PE-O1. Objective:** Same as Alternative 1.	**PE-O1. Objective:** Maintain soil productivity by minimizing soil loss, protecting hydrologic function of slopes, controlling activities that compact surface soils, and managing soil organic matter to maintain the physical, chemical, and biological properties of a soil that make it productive.				
PE-O2. Objective: Varies. See: A1/PE-O3 A1/PE-O4 A1/PE-O5 A1/AQ-O3 A1/AQ-O4 A1/AQ-O5	**PE-O2. Objective:** Same as Alternative 1.	**PE-O2. Objective:** Maintain riparian vegetation, soils, and soil processes to ensure high quality water. Focus efforts on restoring and maintaining floodplain and riparian wetland soils and its ability to immobilize and transform pollutants, nutrients, and sediments; and on restoring and maintaining riparian canopy closure and vegetative structure. (See also RM-S10, RM-S14, AQ-S12, and AQ-S6.) ***Rationale:*** *Floodplain and wetland soils function as sponges which soak up water in addition to pollutants and nutrients, and thereby, provide a mechanism for chemically transforming and immobilizing pollutants, nutrients, and sediments. Water stored in the bank, and the base stream flows such storage provides, sustain riparian vegetation by creating a moist environment year-round.*				
PE-O3. Objective: Varies. See: A1/PE-O1 A1/PE-O4	**PE-O3. Objective:** Same as Alternative 1.	**PE-O3. Objective:** Develop soil productivity protection and restoration programs. Use the protocol from the National Long-term Soil Productivity monitoring program (cooperative program between Forest Service research and National Forest System) and Soil Quality monitoring handbook.				
PE-O4. Objective: Varies. See: A1/PE-O3	**PE-O4. Objective:** Same as Alternative 1.	**PE-O4. Objective:** Restore and maintain nutrient cycling and decomposition processes and soil productivity to provide for sustainable nutrient supply in forest and rangeland ecosystems by providing for levels of vegetation composition, density, size class, and distribution, both in standing and downed biomass comparable to that with which soils evolved. Provide for recruitment of biomass over time. ***Rationale:*** *There is evidence and documentation showing that changes in soils have occurred because of changes in vegetation types and amounts different from those under which soil types developed and evolved. In order to restore and maintain soil productivity and nutrient cycling, and have sustainable vegetation growth and vigor, soils need to continue to develop under conditions similar to those with which they originated.*				

PE-S1. Standard: Varies. See: A1/TE-S15	**PE-S1. Standard:** A1/TE-S15	**PE-S1. Standard:** Recommendations for managing coarse woody debris (downed material greater than three inches in diameter) for soil productivity should be developed which are ecologically appropriate for the local geoclimatic setting and vegetation type. In the absence of local data, the interim levels in Table B shall be used. Coarse woody debris requirements for both soil productivity and plant and animal species needs shall be coordinated. (See also HA-S7 and HA-S8.)	**PE-S1. Standard:** Recommendations for managing coarse woody debris (downed material greater than three inches in diameter) for soil productivity should be developed which are ecologically appropriate for the local geoclimatic setting and vegetation type. In the absence of local data, the interim levels in Table A shall be used. Coarse woody debris requirements for both soil productivity and plant and animal species needs shall be coordinated. (See also HA-S7 and HA-S8.)	**PE-S1. Standard:** Same as Alternative 3.	**PE-S1. Standard:** Same as Alternative 4.	**PE-S1. Standard:** ***Inside reserves:*** Not applicable. ***Outside reserves:*** Same as Alternative 3.

Rationale: *Retention, recruitment, and replacement of coarse woody debris and soil organic matter is needed to restore the soil productivity where it has declined or been lost. Levels of downed wood need to be higher for restoration than for maintenance of soil productivity. Additionally, where levels of downed wood of finer sizes present a high risk of consumption by wildfire, use of prescribed fire can reduce this risk and aid in the maintenance of soil productivity.*

PE-S1. Table A. Coarse woody debris minimum interim standards for Alternatives 4 and 6.

	Total tons/acre[2]		Min. pieces		Min. Diameter (inches)	Min. length (feet)
	distr.[1]	undistr.	distr.	undistr.		
Dry Forest						
Ponderosa pine	8-16	5-8	12	6	12	12
Douglas-fir/grand fir	10-16	5-9	14	8	12	12
Lodgepole pine	8-16	4-8	30	15	8	12
Moist Forest						
Mixed conifer	15-25	10-20	25	20	12	12
Cedar/hemlock	25-35	20-30	35	30	20	20
Cold Forest						
Spruce/fir	8-12	6-10	20	15	10	12
Whitebark pine	10-20	5-15	20	15	10	12

[1]Disturbed sites. Refers to sites where management activities have reduced coarse woody debris or organic matter, compacted soils, or caused soil loss or erosion.
[2]Source for total tons/acre, both disturbed and undisturbed: (Graham et al. 1994, Harvcy et al. 1991).

PHYSICAL ENVIRONMENT

ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7

PE-S1. Table B. Coarse woody debris minimum interim standards for Alternatives 3, 5, and 7 (outside reserves).

	Total tons/acre[2]		Min. pieces		Min. Diameter (inches)	Min. length (feet)
	distr.[1]	undistr.[2]	distr.	undistr.		
Dry Forest						
Ponderosa pine	4-8	2-4	10	5	12	12
Douglas-fir/grand fir	5-9	3-7	8	5	12	12
Lodgepole pine	4-8	3-8	20	18	8	12
Moist Forest						
Mixed conifer	10-20	8-14	20	18	12	12
Cedar/hemlock	25-35	20-30	20	18	24	20
Cold Forest						
Spruce/fir	8-12	6-10	20	15	10	12
Whitebark pine	5-15	4-8	12	10	10	12

[1]Disturbed sites. Refers to sites where management activities have reduced coarse woody debris or organic matter, compacted soils, or caused soil loss or erosion.
[2]Source for total tons/acre, undisturbed only (Fischer 1981, Maxwell and Ward 1980).

ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7
PE-S2. Standard: Varies. See: A1/TE-S15	**PE-S2. Standard:** A1/TE-S15	**PE-S2. Standard:** When salvage harvesting after a wildfire, recommendations for amounts of coarse woody debris retention should be developed for local geoclimatic and vegetation types. In the absence of local data, the following minimum amounts of coarse woody debris shall be provided for, where available. Coarse woody debris requirements for both soil productivity and plant and animal species needs shall be coordinated when developing local guidance. (See also HA-S7 and HA-S8.)	**PE-S2. Standard:** Not applicable.	**PE-S2. Standard:** Not applicable.	**PE-S2. Standard:** Same as Alternative 3.	**PE-S2. Standard:** ***Inside reserves:*** Not applicable. ***Outside reserves:*** Same as Alternative 3.

		Low intensity burn sites: 10 to 15 tons per acre Moderate intensity sites: 15 to 20 tons per acre High intensity burn sites: 20 to 30 tons per acre
PE-S3. Standard: Varies. See: A1/TE-S14	**PE-S3. Standard:** Same as Alternative 1.	**PE-S3. Standard:** Recommendations for amounts and sizes of large diameter standing live and / or dead wood (>12 inches diameter at breast height [dbh]) should be developed for local geoclimatic and vegetation types. In the absence of local data, the following interim amounts of large diameter standing wood shall be retained on site. Coarse woody debris requirements for both soil productivity and plant and animal species needs shall be coordinated when developing local guidance. (See also HA-S7 and HA-S8.) Dry Forest: 2 trees / acre >21inch dbh and 8 trees / acre >12 inch dbh Moist Forest: 6 trees / acre >21 inch dbh and 12 trees / acre >12 inch dbh Cold Forest: 18 trees / acre >12 inch dbh ***Rationale:*** *Large trees are a component of vegetation structure that is lacking in many areas across the project area. This condition has been identified by the Landscape, Terrestrial, and Aquatic staffs of the Science Integration Team. The lack of large trees is particularly pervasive in riparian areas. Large trees are necessary to provide for sustainable carbon and nutrient stores, to provide habitat for terrestrial and aquatic species, for long-term site productivity, for slope-water interactions, and for habitat for soil microbes essential for the decomposition process.*

Air Quality

PE-O5. Objective: Varies. See: A1/PE-O6	**PE-O5. Objective:** Same as Alternative 1.	**PE-O5. Objective:** To protect air quality, comply with federal, state, and local pollution requirements relating to the Clean Air Act. This includes, but is not limited to, state implementation plans, maintaining air quality related values, and conforming to provisions of the Clean Air Act. ***Rationale:*** *Federal land managers must adhere to direction provided in the Clean Air Act in cooperation with the appropriate State Implementation Plans. Current air quality in the project area is relatively good and desirable for human health. This clean air in combination with outstanding scenery is an asset for desired lifestyles of the project area residents and visitors. Historical air quality likely included periods of adverse air quality and related values due to smoke from extensive wildfires, a natural disturbanc*

Physical Environment

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
PE-S4. Standard: Varies. See: A1/PE-S1 A1/PE-G1 A1/PE-S2 A1/PE-G2	**PE-S4. Standard:** Same as Alternative 1.	**PE-S4. Standard:** Environmental analysis for the use of prescribed fire shall address the following key points: (See Objectives EM-O1 and EM-O3.) - Assess the need for burning compared to alternative fuel reduction, site preparation methods, or leaving materials on site. - Quantify the amount and type of material, and acreage to be burned. - Describe the type of burn proposed (for example broadcast, pile, understory). - Quantify emissions of air pollutants. - Describe mitigation measures to reduce emissions. - Describe applicable regulatory, permit, and smoke management requirements. - Describe and quantify air quality impacts on downwind communities and discuss visibility impacts in Class I areas (see Map 2-4). This analysis should include modeling, where appropriate models exist. - Describe the existing monitoring network. If needed, develop a plan to revise or expand monitoring to ensure that the impacts of prescribed burning on air quality are measured.				

Terrestrial Strategies

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
TS-O1. Objective: Varies. See: A1/TE-O6 A1/TE-O3	**TS-O1. Objective:** Same as Alternative 1.	**TS-O1. Objective:** Maintain and promote healthy, productive and diverse native plant communities as appropriate to soil type, climate, and landform.				
TS-S1. Standard: Varies. See: A1/TE-G7 A1/TE-G9	**TS-S1. Standard:** Same as Alternative 1.	**TS-S1. Standard:** Native plant communities shall be maintained or improved to ensure the proper functioning of ecological processes, and continued productivity and diversity of native plant species. Where native plant communities exist, the conversion to exotic communities after disturbance shall be minimized.				

Fire Disturbance Processes

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
TS-O2. Objective: Varies. See: A1/TE-G2	**TS-O2. Objective:** Same as Alternative 1.	**TS-O2. Objective:** Restore fire as a natural disturbance process by developing and implementing prescribed fire plans on a landscape scale. ***Rationale:*** *The* Landscape Dynamics *(Hann et al. 1996)* chapter of the Assessment of Ecosystem *Components identified the change in fire frequency and severity on forest and rangelands as a large contributing factor in the departure of vegetation species composition and structure within the project area.*				
TS-O3. Objective: Varies. See: A1/PE-O4 A1/PE-O5 A1/TE-G9	**TS-O3. Objective:** Same as Alternative 1.	**TS-O3. Objective:** Rehabilitate disturbed areas to restore native species, maintain productivity, and prevent undue soil loss.				
TS-S2. Standard: Varies. See: A1/TE-G10	**TS-S2. Standard:** Same as Alternative 1.	**TS-S2. Standard:** Rehabilitate and / or revegetate disturbed areas with ecologically appropriate species tailored to fire regimes characteristic of sites, wherever it is determined that the density, structure, and composition of the vegetation will not resemble or move towards desired range of future conditions. Applies also to Objectives TS-O6, TS-O8, TS-O10, and TS-O15. ***Rationale:*** *Extensive areas of burned or harvested areas may require treatment because the vegetation that is established following disturbance is incompatible with historical fire regimes. Rehabilitation or reforestation that is compatible with characteristic fire regimes can increase the resilience of such areas. In forest systems, it is economical to thin young trees in areas with denser stands than desired. Plantations that do not require thinning to be resilient to fire are most likely to progress to maturity. In rangeland systems, there are some areas where natural revegetation of a burned area has been altered by exotic species and / or noxious weed invasion. These areas should be seeded with desirable perennial species that are able to outcompete exotic species so the area can be returned to its desired fire regime.*				

TERRESTRIAL STRATEGIES

ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVES 3 – 7
TS-S3. Standard: Varies. See: A1/TE-G9 A1/TE-G10	**TS-S3. Standard:** Same as Alternative 1.	**TS-S3. Standard:** Native species should be used in seedings, except where little chance of success is predicted for establishing native species and introduced species must be used to meet ICBEMP objectives. ***Rationale:*** *For example, in cheatgrass ranges or in some areas with <=10" precipitation, introduced species may be used to meet ICBEMP objectives.*
TS-S4. Standard: Varies. See: A1/TE-G11	**TS-S4. Standard:** Same as Alternative 1.	**TS-S4. Standard:** Areas burned by wildfire or prescribed fire shall be rested from livestock grazing until monitoring data indicate that desired vegetation and litter have recovered to levels that are adequate to maintain soil productivity.

Noxious Weeds

ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVES 3 – 7
TS-O4. Objective: Varies. See: A1/TE-O2 A1/HU-03	**TS-O4. Objective:** Same as Alternative 1.	**TS-O4. Objective:** Restore or maintain biodiversity and productivity of native plant communities by working with federal, tribal, state, county, and city officials to develop and implement one strategy across jurisdictional and political boundaries to manage noxious weeds efficiently and consistently within five years of signing the Record of Decision. ***Rationale:*** *The rapid expansion of noxious weeds in the project area is one of the greatest threats to healthy and less than healthy native plant communities. Noxious weeds are reducing the value of these plant communities in several ways, including decline in quality of wetland and other habitat for wildlife, reduction of forage for grazing animals, potential increase in soil erosion, and potential decline in water quality, reduction in biological diversity, and increase in the economic burden of maintaining the quality of recreation and wilderness areas. Uncoordinated individual efforts by various entities (private, county, state, tribal, and federal) throughout the project area have been ineffective against noxious weeds.*
TS-S5. Standard: Varies. See: A1/TE-S3	**TS-S5. Standard:** Same as Alternative 1.	**TS-S5. Standard:** The integrated weed management (IWM) strategy for noxious weeds shall be implemented unless the intent of Objective TS-O4 can be achieved with an alternative strategy. Below are the seven basic steps, in order of priority, of the IWM strategy. The steps are the same for Alternatives 3 through 7; the difference among alternatives is which steps are emphasized. See Appendix F for a more complete discussion of the seven steps. 1. Inventorying and mapping of noxious weed presence, distribution, and density. 2. Preventing weed encroachment. 3. Detecting and eradicating new introductions of noxious weeds. 4. Containing large-scale infestations of noxious weeds. 5. Controlling-suppressing large-scale infestations of noxious weeds. 6. Revegetating sites that are characterized by existing noxious weed infestations and a lack of understory of native species or exotic perennial seeded species. 7. Implementing proper management practices during the management phase after noxious weed control. ***Rationale:*** *Integrated weed management as proposed by Sheley (1994) is a recognized strategy that establishes basic steps that are recognized by noxious weed experts as being the key to noxious weed control success. Although there are or can be many versions of this strategy, the basic steps and intent are thought to be consistent with most integrated noxious weed efforts in the country. The intent here is to have all the private, tribal, and government entities come up with one strategy to combat noxious weeds on all lands. The IWM strategy is adopted as a fall-back or a template for a noxious weed control strategy.*

TS-S6. Standard: Varies. See: A1/TE-S3	**TS-S6. Standard:** Same as Alternative 1.	**TS-S6. Standard:** On forestlands, steps 1 through 4 of the IWM Strategy shall be used unless a more effective strategy for noxious weed control is developed. (See also TS-S5.)	**TS-S6. Standard:** On forestlands, all seven steps of the IWM Strategy shall be used unless a more effective strategy for noxious weed control is developed. (See TS-S5.)	**TS-S6. Standard:** Same as Alternative 3.	**TS-S6. Standard:** Same as Alternative 4.	**TS-S6. Standard:** Same as Alternative 3.
TS-O5. Objective: Varies. See: A1/TE-O2	**TS-O5. Objective:** Same as Alternative 1.	**TS-O5. Objective:** Implement an integrated weed management strategy to improve biodiversity and productivity of rangelands by using different management emphases in each range cluster as follows (see Map 2-33 for range clusters):				
		A priority for Range Cluster 2 is to conserve biodiversity and productivity of native rangeland plant communities. A priority for Range Cluster 3 is to conserve and restore biodiversity and productivity of native rangeland plant communities. A priority for Range Cluster 5 is to restore biodiversity and productivity of native rangeland plant communities, primarily through the use of native plant species. A priority for Range Clusters 1, 4, and 6 is to restore biodiversity and productivity of native rangeland plant communities, primarily through the use of native plant species, while providing forage for livestock production.	A priority for Range Cluster 2 is to conserve and restore biodiversity and productivity of native rangeland plant communities. A priority for Range Clusters 1, 3, 4, 5, and 6 is to restore biodiversity and productivity of native rangeland plant communities, primarily through the use of native plant species.	A priority for Range Clusters 2 and 4 is to conserve biodiversity and productivity of native rangeland plant communities. A priority for Range Cluster 3 is to conserve and restore biodiversity and productivity of native rangeland plant communities. A priority for Range Clusters 1 and 6 is to restore biodiversity and productivity of native rangeland plant communities, primarily through the use of native plant species, while providing forage for livestock production. While providing forage for livestock production, a priority for Range Cluster 5 is to conserve biodiversity and productivity of native rangeland plant communities.	A priority for Range Clusters 2, 3, and 5 is to conserve and restore biodiversity and productivity of native rangeland plant communities. A priority for Range Clusters 1, 4, and 6 is to restore biodiversity and productivity of native rangeland plant communities, primarily through the use of native plant species.	***Inside reserves:*** Not applicable. ***Outside reserves:*** A priority for Range Clusters 1, 4, and 6 is to restore biodiversity and productivity of native rangeland plant communities, primarily through the use of native plant species, while providing forage for livestock production.

TERRESTRIAL STRATEGIES

ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7
TS-S7. Standard: Varies. See: A1/TE-S3	**TS-S7. Standard:** Same as Alternative 1.	**TS-S7. Standard:** Unless the intent of Objective TS-O5 can be achieved with an alternative weed control strategy, Steps 1 to 4 of IWM shall be implemented. Implement the steps on high disturbance areas and rangeland plant communities that are not infested currently with noxious weeds and are of high susceptibility to invasion by noxious weeds. The priority area for this standard is Range Cluster 2.	**TS-S7. Standard:** Unless the intent of Objective TS-O5 can be achieved with an alternative weed control strategy, Steps 1 to 4 of IWM shall be implemented on high disturbance areas and rangeland plant communities that are not infested currently with noxious weeds and are of high or moderate susceptibility to invasion by noxious weeds; implement Steps 1 to **7** of IWM, and especially Steps 5 to 7, on high disturbance areas and rangeland plant communities that contain noxious weeds and are of high or moderate susceptibility to invasion by noxious weeds. The priority area for this standard is Range Cluster 2.	**TS-S7. Standard:** Unless the intent of Objective TS-O5 can be achieved with an alternative weed control strategy, Steps 1 to 4 of IWM shall be implemented. Implement these steps on high disturbance areas and rangeland plant communities that are not infested currently with noxious weeds and are of high susceptibility to invasion by noxious weeds. The priority areas for this standard are Range Clusters 2 and 4.	**TS-S7. Standard:** Same as Alternative 4, except the priority areas for this standard are Range Clusters 2, 3, and 5.	**TS-S7. Standard:** ***Inside reserves***: Not applicable. ***Outside reserves***: Same as Alternative 3.

TS-S8. Standard: Varies. See: A1/TE-S3	**TS-S8. Standard:** Same as Alternative 1.	**TS-S8. Standard:** Unless the intent of Objective TS-O5 can be achieved with an alternative weed control strategy, Steps 1 to 4 of IWM shall be implemented on high disturbance areas and rangeland plant communities that are not infested currently with noxious weeds and are of high susceptibility to invasion by noxious weeds; Steps 1 to 7 of IWM, and especially Steps 5 to 7, should be implemented on high disturbance areas and rangeland plant communities that contain noxious weeds and are of high susceptibility to invasion by noxious weeds. The priority area for this standard is Range Cluster 3.	**TS-S8. Standard:** Unless the intent of Objective TS-O5 can be achieved with an alternative weed control strategy, Steps 1 to 7 of IWM, and especially Steps 5 to 7, shall be implemented. Implement these steps on high disturbance areas and rangeland plant communities that contain noxious weeds and are of high or moderate susceptibility to invasion by noxious weeds. The prioity areas for this standard are Range Clusters 1, 3, 4, 5, and 6.	**TS-S8. Standard:** Same as Alternative 3.	**TS-S8. Standard:** Not applicable.	**TS-S8. Standard:** Not applicable.

Terrestrial Strategies

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
TS-S9. Standard: Varies. See: A1/TE-S3	**TS-S9. Standard:** Same as Alternative 1.	**TS-S9. Standard:** Unless the intent of Objective TS-O5 can be achieved with an alternative weed control strategy, Steps 1 to 7 of IWM, and especially Steps 5 to 7, shall be implemented. Implement these steps on high disturbance areas and rangeland plant communities that contain noxious weeds and are of high susceptibility to invasion by noxious weeds. The priority area for this objective is Range Cluster 5.	**TS-S9. Standard:** Not applicable.	**TS-S9. Standard:** Unless the intent of Objective TS-O5 can be achieved with an alternative weed control strategy, Steps 1 to 7 of IWM, and especially Steps 5 to 7, shall be implemented on high disturbance areas and rangeland plant communities that contain noxious weeds and are of high susceptibility to invasion by noxious weeds; implement Steps 1 to 4 of IWM on high disturbance areas and rangeland plant communities that are not infested currently with noxious weeds and are of high susceptibility to invasion by noxious weeds. The priority area for this standard is Range Cluster 5.	**TS-S9. Standard:** Not applicable.	**TS-S9. Standard:** Not applicable.

TS-S10. Standard: Varies. See: A1/TE-S3	**TS-S10. Standard:** Same as Alternative 1.	**TS-S10. Standard:** Unless the intent of Objective TS-O5 can be achieved with an alternative weed control strategy, Steps 1 to 7 of IWM, and especially Steps 5 to 7, shall be implemented. Implement these steps on high disturbance areas and rangeland plant communities that contain noxious weeds and are of high susceptibility to invasion by noxious weeds. Priority areas for this standard are Range Clusters 1, 4, and 6.	**TS-S10. Standard:** Not applicable.	**TS-S10. Standard:** Same as Alternative 3, except the priority areas for this standard are Range Clusters 1 and 6.	**TS-S10. Standard:** See TS-S8 for Alternative 4 for direction.	**TS-S10. Standard:** ***Inside reserves***: Not applicable. ***Outside reserves***: Same as Alternative 3.

Rationale: *The amount of noxious weed control varies by alternative and by cluster or clusters. This is based on the intent of the alternative and the integrity and emphasis of the cluster. Some clusters that are of high overall integrity may not need as much noxious weed control efforts as a cluster with low integrity with areas highly susceptible to certain noxious weeds. Prevention and identification or inventory of noxious weeds is a major component of any noxious weed effort and is common to all alternatives and clusters. Differences among alternatives are generally in the amount of efforts in actual control of existing infestations and the rehabilitation of those sites.*

Terrestrial Strategies

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7

Forestlands

Dry Forest

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
TS-O6. Objective: Varies. See: A1/TE-O3 A1/TE-O7	**TS-O6. Objective:** Same as Alternative 1.	**TS-O6. Objective:** Restore ecosystem processes by managing vegetation structure, stand density, species composition, patch size, pattern, and fuel loading and distribution so ecosystems are resilient to endemic levels of fire, insects, and disease. Priority areas for restoration are Forest Clusters 2, 3, 5, 6. Timber production is a byproduct of restoration activities.	**TS-O6. Objective:** Restore ecosystem processes by managing vegetation structure, stand density, species composition, patch size, pattern, and fuel loading and distribution so ecosystems are resilient to endemic levels of fire, insects, and disease. Restoration is the emphasis and priority for the mid- and late-seral, dense multi-layer communities in currently roaded portions of Forest Clusters 2, 3, 5, and 6. Timber production is a byproduct of restoration activities.	**TS-O6. Objective:** Restore ecosystem processes by managing vegetation structure, stand density, species composition, patch size, pattern, and fuel loading and distribution so ecosystems are resilient to endemic levels of fire, insects, and disease. Priority areas for restoration are in Forest Clusters 2, 3, 5, and 6, while emphasizing timber production in Forest Cluster 4.	**TS-O6. Objective:** Same as Alternative 4.	**TS-O6. Objective:** ***Inside reserves:*** Natural disturbance processes drive restoration of ecosystem processes. ***Outside reserves:*** Same as Alternative 3.

Rationale: *The* Landscape Dynamics *(Hann et al. 1996)* chapter of the Assessment of Ecosystem Components *described dry forest departure (difference) from historical conditions. These changes include loss of scattered overstory ponderosa pine, western larch, and Douglas-fir; a loss of single-layer late-seral structural stages; increase in mid-seral multi-layer structural stages; a general trend toward increased tree densities; a shift of species from shade-intolerant to shade-tolerant; and a shift from a dominance of low intensity/high frequency fire regimes toward higher intensity/lower frequency regimes. These changes have predisposed forest landscapes to larger-scale disturbances than would have naturally occurred with endemic fire, insect and disease disturbances. Wildlife habitat characterized by relatively large fire tolerant trees and single-layer late-seral structural stages has declined.*

TS-S11. Standard: Varies. See: A1/TE-S5 A1/TE-S6	**TS-S11. Standard:** Same as Alternative 1.	**TS-S11. Standard:** In dry forests, dominance of ponderosa pine and western larch in mature and old single-layer forests and mature and old multi-layer forests shall be increased. Decrease the amount of grand fir and white fir in all structural stages. Decrease the amount of Douglas-fir in all structural stages where not historically maintained by the dominant fire regime.	**TS-S11. Standard:** ***Inside reserves***: Not applicable. ***Outside reserves***: Same as Alternative 3.
TS-S12. Standard: Varies. See: A1/TE-S5	**TS-S12. Standard:** Same as Alternative 1.	**TS-S12. Standard:** Not applicable.	**TS-S12. Standard:** ***Inside reserves***: Not applicable. ***Outside reserves:*** Do not harvest dominant or co-dominant ponderosa pine from any dry forest stand unless necessary for stand stocking level control and health.
TS-S13. Standard: Varies. See: A1/TE-S5 A1/TE-S13 A1/TE-G4	**TS-S13. Standard:** A1/TE-S5 A1/TE-S13 A1/TE-G4	**TS-S13. Standard:** Not applicable.	**TS-S13. Standard:** ***Inside reserves***: Not applicable. ***Outside reserves***: In dry forests, mature and old forests shall not be entered for silvicultural treatments, and trees of any species older than 150 years or with a diameter at breast height of 20 inches or greater shall not be cut, except where it can be demonstrated that treatment is necessary to maintain the stand's ecological integrity.

Terrestrial Strategies

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
TS-S14. Standard: Varies. See: A1/TE-S21 A1/TE-S5	**TS-S14. Standard:** Same as Alternative 1.	**TS-S14. Standard:** Not applicable.				**TS-S14. Standard:** ***Inside reserves:*** There shall be no scheduled timber harvest from dry forests in reserves. Limited silvicultural activities should be allowed to enhance viable populations of plants and animals. Applies also to Objectives TS-O9 and TS-O11. ***Outside reserves:*** Not applicable.
TS-O7. Objective: Varies. See: A1/TE-O4 A1/HU-O5 A1/HU-O8 A1/HU-O9 A1/HU-S5 A1/HU-S6	**TS-O7. Objective:** Same as Alternative 1.	**TS-O7. Objective:** Manage production activities and their levels on available and suitable lands to produce commodities in areas that are within the ICBEMP Desired Range of Future Conditions. At the same time, maintain ecosystem processes, including disturbance intensities and frequencies, within the desired range of variability. ***Rationale:*** *Production of commodities can be consistent with ecological objectives on suitable forest lands. Desired range of variability refers to the bounds within which the ecosystem conditions and processes must fluctuate in order to obtain or maintain the desired range of future conditions. The desired range of variability may be different from historical range of variability.*				**TS-O7. Objective:** ***Inside reserves:*** Not applicable. ***Outside reserves:*** Same as Alternative 3.

Moist Forest

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
TS-O8. Objective: Varies. See: A1/TE-O3 A1/TE-O7	**TS-O8. Objective:** Same as Alternative 1.	**TS-O8. Objective:** Restore ecosystem processes by managing vegetation structure, stand density, species composition, patch size, patch distribution, and fuel loading and distribution so the ecosystem is resilient to fire, insects, and disease. Priority areas for restoration are in Forest Clusters 2, 3, 4, and 6. Timber production is emphasized as a byproduct of restoration activities.	**TS-O8. Objective:** Restore ecosystem processes by managing vegetation structure, stand density, species composition, patch size, patch distribution, and fuel loading and distribution so the ecosystem is resilient to fire, insects, and disease. Restoration is the emphasis for activity, and priority areas for restoration are the mid- and late-seral, dense multi-layer communities in currently	**TS-O8. Objective:** Restore ecosystem processes by managing vegetation structure, stand density, species composition, patch size, patch distribution, and fuel loading and distribution so the ecosystem is resilient to fire, insects, and disease. Priority areas for restoration are in Forest Clusters 2, 3, 5, and 6, while emphasizing timber production in Forest Clusters 4 and 6.	**TS-O8. Objective:** Same as Alternative 4.	**TS-O8. Objective:** ***Inside reserves:*** Natural disturbance processes drive restoration of ecosystem processes. ***Outside reserves:*** Same as Alternative 3.

		roaded portions of Forest Clusters 2, 3, 4, and 6. Timber production is a byproduct of restoration activities.	
TS-S15. Standard: Not applicable.	**TS-S15. Standard:** Not applicable.	**TS-S15. Standard:** In moist forest, management activities shall be conducted to maintain viability of and/or attain an increase of western white pine in areas where it is adapted.	
TS-S16. Standard: Not applicable.	**TS-S16. Standard:** Not applicable.	**TS-S16. Standard:** In moist forests, plant blister-rust- resistant stock, and reduce competition to increase the abundance, diversity, and distribution of western white pine where it occurred naturally. ***Rationale:*** *There has been extensive loss and poor regeneration of western white pine in the moist forest potential vegetation group as a result of blister rust infestations (Hann et al. 1996).*	
TS-S17. Standard: Varies. See: A1/TE-S5 A1/TE-S6	**TS-S17. Standard:** Same as Alternative 1.	**TS-S17. Standard:** In moist forest, the dominance of early successional shade-intolerant species shall be increased, and the presence of late successional, shade-tolerant species shall be decreased where mixed severity fire regimes are characteristic. ***Rationale:*** *The* Landscape Dynamics *(Hann et al. 1996)* chapter of the Assessment of Ecosystem Components *identified moist forest as exhibiting significant change from historical times, although less than in dry forest. Much the same as dry forest, these changes include a loss of scattered overstory ponderosa pine, western larch and western white pine, loss of single-layer ponderosa pine and co-dominant seral species, an increase in multi-layer structural stages and a general trend toward overstocking and change of species from shade-intolerant to shade-tolerant. These changes, together with the introduction of white pine blister rust have predisposed forest landscapes to larger-scale and more severe disturbances than would have naturally occurred from fire, insects, and disease. Late- and early-seral structures have significantly declined, with compensating increases in mid-seral structure across most sub-basins. Consequently, forest structure is more homogeneous than it was historically. One result has been a reduction of wildlife habitat, especially large trees and old/mature single-layer structural stages*	**TS-S17. Standard:** ***Inside reserves:*** Not applicable. ***Outside reserves:*** Same as Alternative 3.
TS-S18. Standard: Varies. See: A1/TE-S5	**TS-S18. Standard:** Same as Alternative 1.	**TS-S18. Standard:** Not applicable.	**TS-S18. Standard:** ***Inside reserves:*** Not applicable. ***Outside reserves:*** Dominant or co-dominant ponderosa pine shall not be harvested from any moist forest stand unless necessary for stand stocking level control and health.

TERRESTRIAL STRATEGIES

ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7
TS-S19. Standard: Varies. See: A1/TE-S5 A1/TE-S13 A1/TE-G4	**TS-S19. Standard:** Same as Alternative 1.	**TS-S19. Standard:** Not applicable.				**TS-S19. Standard:** ***Inside reserves:*** Not applicable. ***Outside reserves:*** In moist forests, mature/old forests shall not be entered for silvicultural treatments, and trees of any species older than 150 years or with a diameter at breast height of 20 inches or greater shall not be cut, except where it can be demonstrated that treatment is necessary to maintain the stand's ecological integrity.
TS-S20. Standard: Varies. See: A1/TE-S21	**TS-S20. Standard:** Same as Alternative 1.	**TS-S20. Standard:** Not applicable.				**TS-S20. Standard:** ***Inside reserves:*** In moist forests, there shall be no scheduled timber harvest in reserves. Limited silvicultural activities shall be allowed to enhance viable populations. Applies to Objectives TS-O7, TS-O9, and TS-O11. ***Outside reserves:*** Not applicable.

TS-O9. Objective: Varies. See: A1/TE-O3 A1/HU-O5 A1/HU-O8 A1/HU-O9 A1/HU-S5 A1/HU-S6	**TS-O9. Objective:** Same as Alternative 1.	**TS-O9. Objective:** Manage production activities and their levels on available and suitable lands to produce commodities in areas that are within the ICBEMP Desired Range of Future Conditions. At the same time, maintain ecosystem processes, including disturbance intensities and frequencies, within the desired range of variability. ***Rationale**: Production of commodities can be consistent with ecological objectives on suitable forest lands. Desired range of variability refers to the bounds within which the ecosystem conditions and processes must fluctuate in order to obtain or maintain the desired range of future conditions. The desired range of variability may be different from historical range of variability.*				**TS-O9. Objective:** ***Inside reserves***: Not applicable. ***Outside reserves***: Same as Alternative 3.
Cold Forest						
TS-O10. Objective: Varies. See: A1/TE-O3 A1/TE-O7	**TS-O10. Objective:** Same as Alternative 1.	**TS-O10. Objective:** Restore ecosystem processes by managing vegetation structure, stand density, species composition, patch size, patch distribution, and fuel loading and distribution so the ecosystem is resilient to fire, insects, and disease.	**TS-O10. Objective:** Restore ecosystem processes by managing vegetation structure, stand density, species composition, patch size, patch distribution, and fuel loading and distribution so the ecosystem is resilient to fire, insects, and disease. Restoration is the emphasis for activity. Timber production is a byproduct of restoration activities.	**TS-O10. Objective:** Same as Alternative 3.	**TS-O10. Objective:** Same as Alternative 4.	**TS-O10. Objective:** ***Inside reserves***: Natural disturbance processes drive restoration of ecosystem processes. ***Outside reserves***: Same as Alternative 3.
		***Rationale:** The cold forest potential vegetation group exhibits the least amount of departure from historical conditions within the project area, although it does exhibit significant changes in forest structure and composition in some forest clusters. Because of the naturally longer time intervals between fire disturbance events, this potential vegetation group has not been affected as much by fire exclusion as dry and moist potential vegetation groups. Primary concern at this time is the loss of whitebark pine and subalpine larch across the cold forest landscape. Cold forests of most sub-basins are only modestly productive.*				
TS-S21. Standard: Not applicable.	**TS-S21. Standard:** Not applicable.	**TS-S21. Standard:** In cold forests where they are adapted, the viability of whitebark pine and subalpine larch shall be maintained, and the abundance, diversity and distribution shall be increased. Blister-rust-resistant stock shall be planted, rust-promoting stand conditions of whitebark pine reduced, completetition reduced, natural regeneration promoted, and other methods used. ***Rationale:** The* Landscape Dynamics *(Hann et al. 1996)* chapter of the Assessment of Ecosystem Components *found that the primary concern at this time in the cold forest potential vegetation group is the loss of whitebark pine and subalpine larch landscape-wide due to the introductions of white pine blister rust.*				

Terrestrial Strategies

Alternative 1	Alternative 2	Alternatives 3, 4, 5, 6	Alternative 7
TS-O11. Objective: Varies. See: A1/TE-O3 A1/HU-O5 A1/HU-O8 A1/HU-O9 A1/HU-S5 A1/HU-S6	**TS-O11. Objective:** Same as Alternative 1.	**TS-O11. Objective:** Manage production activities and their levels on available and suitable lands to produce commodities in areas that are within the ICBEMP Desired Range of Future Conditions. At the same time, maintain ecosystem processes, including disturbance intensities and frequencies, within the desired range of variability. ***Rationale***: *Production of commodities can be consistent with ecological objectives on suitable forest lands. Desired range of variability refers to the bounds within which the ecosystem conditions and processes must fluctuate in order to obtain or maintain the desired range of future conditions. The desired range of variability may be different from historical range of variability.*	**TS-O11. Objective:** ***Inside reserves***: Not applicable. ***Outside reserves***: Same as Alternative 3.

Rangelands

Alternative 1	Alternative 2	Alternatives 3–7
TS-O12. Objective: Varies. See: A1/TE-O5 A1/PE-O3	**TS-O12. Objective:** Same as Alternative 1.	**TS-O12. Objective:** Restore or maintain rangeland health.
TS-S22. Standard: Varies. See: A1/TE-G7 A1/TE-S12 A1/TE-G8 A1/TE-G9 A1/TE-G10 A1/TE-G11 A1/TE-S16 A1/TE-S17 A1/TE-S19 A1/TE-S10 A1/AQ-S1 A1/AQ-S3	**TS-S22. Standard:** Same as Alternative 1.	**TS-S22. Standard:** Rangeland management strategies shall be implemented to achieve the maintenance or restoration of watershed function; nutrient cycling and energy flow; water quality; habitat for endangered, threatened, proposed, candidate, or special status species; and habitat quality for populations and communities of native biota. ***Rationale:*** *Healthy ecosystem functions are essential to rangeland health especially in the dry shrublands and during drought years. Effective management for these functions permits: soil to retain and release water for longer periods during the year which prolong the vegetative growing season; protection of soil from erosion as a result of cover from litter and residual vegetation; and plans to restore and or maintain vigor or plant health through photosynthesis and the building of a strong root system. Effective management strategies include proper timing of grazing use and the leaving of residual vegetation and litter so that vegetative and soil functions are enhanced. Maintenance or restoration of ecosystem functions is important for maintaining or improving habitat quality for native species including endangered, threatened, proposed, candidate or special status species.*

TS-S23. Standard: Varies. See: A1/TE-G8 A1/TE-G11 A1/PE-O3	**TS-S23. Standard:** Same as Alternative 1.	**TS-S23. Standard:** On dry shrublands, livestock grazing shall be managed to maintain soil and vegetative health and productivity during and directly after drought years (approximately 75% of normal precipitation and below). Applies also to Objective TS-O1, TS-O2, and TS-O5. ***Rationale:*** *The* Scientific Assessment *identified improper livestock grazing during and after drought years as being one of the major impacts to the health of the rangelands. See rationale for Standard TS-S22.*				**TS-S23. Standard:** ***Inside reserves***: Not applicable. ***Outside reserves***: Same as Alternative 3.
TS-O13. Objective: Varies. See: A1/TE-O5 A1/PE-O3	**TS-O13. Objective:** Same as Alternative 1.	**TS-O13. Objective:** Produce livestock forage, while restoring ground cover and productivity of perennial vegetation communities that have converted to annual grass-dominated communities within Range Clusters 1 and 6.	**TS-O13. Objective:** Restore ground cover and productivity of perennial vegetation communities that have converted to annual grass-dominated communities within Range Clusters 1, 5, and 6, which have equal priority for treatment.	**TS-O13. Objective:** Same as Alternative 3.	**TS-O13. Objective:** Restore ground cover and productivity of perennial vegetation communities that have converted to annual grass-dominated communities within Range Clusters 1 and 5, which are the highest priority for treatment.	**TS-O13. Objective:** Not applicable.
		Rationale: *Altered sagebrush steppe or annual grass-dominated communities, such as cheatgrass ranges, are lacking in biodiversity, consistent productivity, and soil protection, which affects the natural disturbances and processes that are a part of a healthy rangeland system. These areas are poor habitat for many wildlife species; they tend to burn frequently, which perpetuates annual grass domination of these areas and encroachment onto adjacent areas; and they are susceptible to accelerated erosion especially during drought years when there is little to no vegetative cover. In addition, these areas are susceptible to invasion from noxious weeds such as yellow starthistle, which has no basic livestock or wildlife value. Reestablishment of perennial vegetation would provide for protection of the soil, more consistent forage production for livestock and wildlife, and greater biodiversity.*				
TS-O14. Objective: Varies. See: A1/TE-O5 A1/PE-O3	**TS-O14. Objective:** Same as Alternative 1.	**TS-O14. Objective:** In areas where encroachment of or densities of juniper, conifers and sagebrush are reducing rangeland productivity and biodiversity, restore rangeland productivity and native biodiversity by implementing management strategies that reduce the densities of these species on dry and cool shrublands, dry grasslands. riparian and wetland areas. Priority areas are the above vegetation types in Range Clusters 3, 5, and 6 for the UCRB. (See also AQ-O10.) ***Rationale:*** *Late-seral structural stages of juniper, conifers, and sagebrush were typically limited on a historical basis due to fire. Higher density juniper woodlands tended to be limited to areas with high surface rock shallow soils and steep broken terrain where fire spread did not occur uniformly. Mosaic patterns of sagebrush communities which occurred historically have in some areas been limited due to fire suppression or lack of fine fuels. The lack of fire in grassland communities has allowed conifers to encroach upon and affect the production and diversity of grassland communities. Restoration of biodiversity, production, and/or livestock forage is compatible with this fire regime.*				**TS-O14. Objective:** ***Inside reserves***: Not applicable. ***Outside reserves***: Same as Alternative 3.

Terrestrial Strategies

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
TS-O15. Objective: Varies. See: A1/TE-O5 A1/PE-O3	**TS-O15. Objective:** Same as Alternative 1.	**TS-O15. Objective:** Restore dry grasslands, dry shrublands, and cool shrublands in Range Clusters 1, 5, and 6, while producing livestock forage in Range Clusters 1 and 6. Priority areas for restoration are Range Clusters 1 and 5.	**TS-O15. Objective:** Restore dry grasslands, dry shrublands, and cool shrublands in Range Clusters 1, 5, and 6.	**TS-O15. Objective:** Restore dry grasslands, dry shrublands, and cool shrublands in Range Clusters 1 and 6, while producing forage for livestock production.	**TS-O15. Objective:** Restore dry grasslands, dry shrublands, and cool shrublands in Range Clusters 1, 5, and 6. Dry shrublands are the highest priority for initial treatment and establishment of experimental studies.	**TS-O15. Objective:** ***Inside reserves:*** Conserve or restore dry grasslands, dry shrublands, and cool shrublands in Range Clusters 1, 5, and 6 by primarily emphasizing natural disturbance processes. ***Outside reserves:*** Same as Alternative 3.

Rationale: *Dry grasslands, dry shrublands, and cool shrublands are highly departed in frequency and composition from historical levels and conditions. Consequently associated species of native flora and fauna have declined or been locally extirpated, which has caused major concern. Range Clusters 1, 5, and 6 have the most acres of the major rangeland potential vegetation groups (PVGs) and most of the rangeland problems or concerns which include cheatgrass and other annual plant infestations, noxious weeds, juniper encroachment, and sagebrush density. Of the three PVGs, dry shrublands are the most susceptible to degradation and are not as resilient as the other PVGs. Restoration activities, especially in these clusters and the dry shrubland PVG, are consistent with treatment of the rangeland areas identified in the* Scientific Assessment *as having the most problems. Clusters 1 and 6 have a high priority for emphasizing livestock forage production because of their proximity to ranching operations, minimal amount of resource conflicts (recreation vs. grazing for example), topography, and the availability of existing range improvements.*

Alternative 1	Alternative 2	Alternatives 3–6	Alternative 7
TS-S24. Standard: Varies. See: A1/TE-S22	**TS-S24. Standard:** Same as Alternative 1.	**TS-S24. Standard:** Not applicable.	**TS-S24. Standard:** ***Inside reserves:*** Livestock grazing shall not be allowed in reserves unless livestock grazing use is needed to achieve the intent of the reserve, such as controlling noxious weeds or reducing fine fuels in altered sagebrush steppe. ***Outside reserves:*** Not applicable.

TS-S25. Standard: Not Applicable.	**TS-S25. Standard:** Not Applicable.	**TS-S25. Standard:** Not applicable.				**TS-S25. Standard:** ***Inside reserves***: Range improvement projects, such as juniper and conifer control, or seeding with introduced or native species, shall not be allowed in reserves unless they are needed to achieve the intent of the reserve. ***Outside reserves***: Not applicable. ***Rationale:*** Since some of the reserves have been altered significantly by human effects it is logical to allow some human intervention to solve some of the human induced problems such as noxious weeds, which may not be solved in a reasonable timeframe by natural means, as long as the action meets the intent of the reserve.
TS-O16. Objective: Not Applicable.	**TS-O16. Objective:** Not applicable.	**TS-O16. Objective:** Not applicable.	**TS-O16. Objective:** Not applicable.	**TS-O16. Objective:** Conserve cool shrublands, dry shrublands and dry grasslands while producing livestock forage in Range Cluster 5. ***Rationale:*** *In Alternative 5, Range Cluster 5 is a livestock forage production priority area with moderate ecological integrity. Therefore, to produce forage while conserving the resource is consistent with the intent of this alternative and the basic rangeland health of the cluster.*	**TS-O16. Objective:** Not applicable.	**TS-O16. Objective:** Not applicable.

Aquatic/Riparian Strategies

Alternative 1	Alternative 2	Alternative 3 / Alternative 4 / Alternative 5 / Alternative 6 / Alternative 7
AQ-O1. Objective: Varies. See: A1/AQ-O1 A1/AQ-O3 A1/AQ-O4	**AQ-O1. Objective:** Same as Alternative 1, plus: A2/AQ-O1 A2/AQ-O2 A2/AQ-O3 A2/AQ-O4	**AQ-O1. Objective:** Manage riparian and aquatic areas primarily to emphasize the restoration and maintenance of riparian and aquatic processes and functions. (See also EM-O3, RM-S1, RM-S4, RM-S7, RM-S10, RM-S14, and RM-S9.]. ***Rationale:*** *Riparian and aquatic areas are generally productive, complex areas that, through a variety of processes and functions, provide unique, limited habitats for many aquatic- and riparian-associated species.*
AQ-O2. Objective: Varies. See: A1/AQ-O1 A1/AQ-O2	**AQ-O2. Objective:** Same as Alternative 1, plus: A2/AQ-O1 A2/AQ-O2 A2/AQ-O3 A2/AQ-O4	**AQ-O2. Objective:** Maintain high quality and restorable aquatic and riparian areas to achieve conditions that support aquatic- and riparian-associated species. ***Rationale:*** *Restorable areas are those degraded habitats that have historically supported self-sustaining native plant and animal populations or currently support such populations; have the potential to reasonably support re-established or increased future population levels and/or provide increased migration corridors, with proper management actions; and are considered to be important for contribution to the conservation of imperiled species and/or recovery of listed species.*
AQ-O3. Objective: Varies. See: A1/AQ-O2	**AQ-O3. Objective:** Same as Alternative 1, plus: A2/AQ-O1 A2/AQ-O2 A2/AQ-O3 A2/AQ-O4	**AQ-O3. Objective:** Protect high quality waters and identify and maintain habitats to meet aquatic, riparian, and terrestrial species, and social needs. ***Rationale:*** *For the purposes of this document, high quality waters include waters whose quality is necessary to support threatened, endangered, candidate, and sensitive species restoration, conservation, or recovery; waters/watersheds used as sources of public drinking water; waters/watersheds where groundwater recharges to Sole Source Aquifers designated under the Safe Drinking Water Act; and waters whose quality is necessary to support all designated beneficial uses.*
AQ-O4. Objective: A1/AQ-O2	**AQ-O4. Objective:** Same as Alternative 1, plus: A2/AQ-O2	**AQ-O4. Objective:** In Category 1 sub-basins, maintain watershed health, aquatic health, aquatic habitat integrity and connectivity, and water quality. (See Map 2-25; See also EM-S7.) ***Rationale:*** *Category 1 sub-basins provide the best opportunity to maintain large blocks of fully functioning aquatic/riparian ecosystems and associated connectivity. Conservation of these watersheds provides the best opportunity for long-term persistence of native aquatic assemblages and may be an important source of individuals repopulating other areas.*

AQ-05. Objective: Varies. See: A1/AQ-O1 A1/AQ-O3 A1/AQ-O4	**AQ-05. Objective:** Same as Alternative 1, plus: A2/AQ-O4	**AQ-05. Objective:** Restore watersheds and aquatic and riparian areas where natural watershed processes, functions, and conditions have been degraded.			
AQ-06. Objective: Varies. See: A1/AQ-O1 A1/AQ-O3 A1/AQ-O4	**AQ-06. Objective:** Same as Alternative 1, plus: A2/AQ-O4	**AQ-06. Objective:** Implement watershed restoration activities based on priorities established from Ecosystem Analysis at the Watershed Scale, where available, using "*A Framework for Analyzing the Hydrologic Condition of Watersheds*, version 2.2 (December 1996) or successors. ***Rationale:*** A Framework for Analyzing the Hydrologic Condition of Watersheds *was designed to provide a consistent approach for hydrologists and watershed specialists to follow when preparing information about hydrologic condition or function for interaction with interdisciplinary teams. The process parallels that of the federal guide and facilitates the development of ecosystem analysis.*			
AQ-07. Objective: Varies. See: A1/AQ-O1 A1/AQ-O2 A1/AQ-O3 A1/AQ-O4	**AQ-07. Objective:** Same as Alternative 1, plus: A2/AQ-O3	**AQ-07. Objective:** In Category 2 sub-basins, maintain native aquatic species strongholds and high quality habitat and water, restore degraded habitat, and restore connectivity within and between watersheds where populations of native aquatic species are presently fragmented because of habitat loss or disruption. Improve watershed health and integrity and water quality in areas where natural watershed function and condition have been degraded. ***Rationale:*** *Category 2 sub-basins support important aquatic resources often with component watersheds classified as strongholds for one or multiple fish species. The integrity of the fish assemblage is generally high. This category may have watersheds where native aquatic species have been extirpated or are at risk for a variety of reasons. Connectivity among watersheds should still exist through the mainstream river system, or have a good chance of being restored, such that maintenance or restoration of life-history patterns and dispersal of individuals among watersheds is possible.*			**AQ-07. Objective:** ***Inside reserves:*** Not applicable. ***Outside reserves:*** Same as Alternative 3.
AQ-08. Objective: Varies. See: A1/AQ-O2	**AQ-08. Objective:** Same as Alternative 1, plus: A2/AQ-O1 A2/AQ-O3	**AQ-08. Objective:** See AQ-O4, AQ-O7, AQ-O9.	**AQ-08. Objective:** ***Inside timber and livestock priority areas:*** Conserve remaining native aquatic species strongholds and high quality habitat and water for federally listed threatened, endangered, and candidate riparian-associated and aquatic species while maximizing production activities. (See also AQ-O4.)	**AQ-08. Objective:** Same as Alternative 3.	**AQ-08. Objective:** Same as Alternative 3.

AQUATIC/RIPARIAN STRATEGIES

ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7
				Outside timber and livestock priority areas: Same as Alternative 3.		
AQ-O9. Objective: Varies. See: A1/AQ-O1 A1/AQ-O2 A1/AQ-O3 A1/AQ-O4	**AQ-O9. Objective:** Same as Alternative 1, plus: A2/AQ-O1	**AQ-O9. Objective:** In Category 3 sub-basins, maintain native aquatic species strongholds and high quality habitat and water. Maintain or improve water quality to sustain designated beneficial uses. ***Rationale:*** *Category 3 sub-basins are highly fragmented; however, some component watersheds support federally listed or other rare and sensitive fish. The opportunity for restoring mainstream connectivity is limited; however, opportunities may be present within or between component watersheds and mainstream rivers.*				**AQ-O9. Objective:** ***Inside reserves:*** Not applicable. ***Outside reserves:*** Same as Alternative 3.

Watershed & Riparian Restoration

ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7
AQ-O10. Objective: Varies. See: A1/AQ-O3 A1/AQ-O4	**AQ-O10. Objective:** Same as Alternative 1, plus: A2/AQ-O4	**AQ-O10. Objective:** Manage riparian vegetation to restore or maintain structure, age, and composition consistent with site potential.				
AQ-S1. Standard: Varies. See: A1/AQ-S1 A1/AQ-S2 A1/AQ-S3 A1/AQ-G1 A1/AQ-G2	**AQ-S1. Standard:** Same as Alternative 1, plus: A2/AQ-S28	**AQ-S1. Standard:** Watershed restoration projects shall be designed and implemented to promote the long-term ecological integrity of ecosystems, conserve the genetic integrity of native species, promote the recovery of listed species, and contribute to attainment of RMOs.				**AQ-S1. Standard:** Areas that are in obvious need of watershed restoration shall be identified. Priorities shall be based on existing and potential risks to and effects on listed aquatic- or riparian-dependent species and their habitat, as well as on the likely effectiveness of the restoration effort.

AQ-S2. Standard: Varies. See: A1/AQ-O4 A1/TE-G8	**AQ-S2. Standard:** Same as Alternative 1, plus: A2/AQ-S29	**AQ-S2. Standard:** Management activities shall be implemented to attain proper functioning condition (BLM Technical Report 1737-9 [1993] and 1737-11 [1994]) as a first step to move habitat conditions of streams, riparian areas, or lakes and ponds toward achieving terrestrial and aquatic objectives. ***Rationale:*** *Management practices such as grazing, recreation, fuels management and other forms of vegetative management are expected to be designed to provide for the health, form, and function of riparian systems. Determining Proper Functioning Condition (PFC) is an interdisciplinary process done in conjunction with ecosystem analysis at the landscape level. Riparian Management Objectives (RMOs) are generally instream and riparian attributes expressed as a single or range of values. These attributes will generally fall between PFC and biological potential. Attainment of PFC assures that stream and riparian areas function well and are on an improving trend. Riparian Management Objectives then become specific measures designed to support overall aquatic/riparian functions. Until PFC is attained, management priorities and options focus on reaching this threshold over time. The desired range of future conditions generally lie between the PFC and biological potential supported by RMOs. Management prescriptions will focus on attainment of this desired condition, not just the attainment of PFC.*	
AQ-S3. Standard: Varies. See: A1/AQ-O1 A1/AQ-S3 A1/TE-S19	**AQ-S3. Standard:** Same as Alternative 1, plus: A2/AQ-S28	**AQ-S3. Standard:** Not applicable.	**AQ-S3. Standard:** Watershed restoration plans shall be developed to put instream structures and road obliteration/reconstruction projects into context of all other planned watershed restoration. Plans shall address causes of degradation and should use the limiting factor analysis, currently under development by National Marine Fisheries Service. The plan also should include the following: - Site-specific NEPA analysis. - A biological evaluation/ assessment for all "may affect" projects (as defined by the Endangered Species Act). - Certification by both a hydrologist and fishery biologist.

AQUATIC/RIPARIAN STRATEGIES

ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7
AQ-S4. Standard: Varies. See: A1/AQ-O1 A1/PE-O4 A1/AQ-S1	**AQ-S4. Standard:** Same as Alternative 1.	**AQ-S4. Standard:** Not applicable.				**AQ-S4. Standard:** If fine sediment RMOs **are met** and: If estimated sediment delivery is <20% over natural rates,then new activities with potential to produce sediment shall be compensated for through active restoration to abate an equivalent amount of sediment. If estimated sediment delivery is >20% over natural rates,then sediment delivery shall be reduced through passive and active restoration until compensated for with sediment abatement measures resulting in a net reduction in sediment delivery. If fine sediment RMOs are **not met** and: If estimated sediment delivery is <20% over natural rates,then sediment delivery shall be reduced through passive restoration until fine sediment RMOs are met or there is an improving trend for at least five years. Implement active restoration as needed to reduce sediment delivery.

			AQ-S4. Standard (cont.): If estimated sediment delivery is >20% over natural rates, then sediment delivery shall be reduced through passive restoration until it is less than 20% over natural rates and fine sediment RMOs are met or there is an improving trend for at least five years. Implement active restoration as needed to reduce sediment delivery. (See also Appendix G.)
AQ-S5. Standard: Varies. See: A1/AQ-S1	**AQ-S5. Standard:** Same as Alternative 1, plus: A2/AQ-S29	**AQ-S5. Standard:** Fish and wildlife habitat restoration and enhancement actions shall be designed and implemented to contribute to attainment of RMOs.	

AQUATIC/RIPARIAN STRATEGIES

Aquatic Standards - Timber Management

ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7
AQ-S6. Standard: Varies. See: A1/AQ-G2	**AQ-S6. Standard:** Same as Alternative 1, plus: A2/AQ-S1	**AQ-S6. Standard:** Prohibit timber harvest, including fuelwood cutting, in RCAs except as described below: - Where catastrophic events such as fire, flooding, volcanic, wind, or insect damage result in degraded riparian conditions, allow salvage and fuel cutting in RCAs only where present and future woody debris needs are met, where cutting would not retard or prevent attainment of other RMOs and where adverse effects can be avoided to aquatic resources.	**AQ-S6. Standard: Zones 1, 2a, and 2b (RCA):** The primary purpose of RCAs shall be maintenance and restoration of riparian and instream processes and functions. Vegetation management actions in RCAs shall result in minimal ground disturbance and shall not result in degradation of aquatic and riparian resources. Vegetation management in Zones 1 and 2a shall be conducted only to restore or maintain riparian and instream processes and functions. (See also AQ-S7, AQ-S8.) For vegetation management within Zone 2b see Standard AQ-S10. Timely opportunities shall be provided to intergovernmental partners for agreement on vegetation management actions in RCAs. See Appendix G for discussions of processes, functions, and intents.	**AQ-S6. Standard:** ***Inside timber and livestock priority areas:*** There shall be no timber harvest within 20 feet of fish-bearing streams. Selective timber harvesting is permitted between 20 and 100 feet of fish-bearing streams and subject to the following conditions: - In riparian areas adjacent to perennial and intermittent streams, the maximum area that shall be considered for shade and temperature control is 75 feet from the active channel margin. Trees not required for present or future shade and temperature considerations may be selectively harvested.	**AQ-S6. Standard: Zones 1, 2a, and 2b (RCA):** Same as Alternative 4.	**AQ-S6. Standard: RCAs:** Prohibit timber harvest, including fuelwood cutting in RCAs and aquatic reserves, except as described below: - Allow timber extraction, including fuelwood cutting, from RCAs only when RMOs are attained and management standards can be met. Timber harvest shall result in neutral or beneficial effects to water quality, fish and other riparian-dependent resources. Ecosystem Analysis shall be completed prior to timber harvest and should show compelling scientific and logical reasons to assure timber harvest in RCAs would not degrade RMOs or result in adverse effects to clean water, fish, or other aquatic resources. (See objective EM-O4 and EM-S5 to EM-S14.)

AQ-S6. Standard (cont.):

- Apply silvicultural practices for RCAs to acquire desired vegetation characteristics where needed to attain RMOs. Apply silvicultural practices in a manner that does not retard attainment of RMOs and that avoids adverse effects on aquatic resources.

AQ-S6. Standard (cont.):

- In riparian areas adjacent to perennial and intermittent streams, the maximum area that should be considered for large woody debris recruitment is one effective tree height around all active channel migration zones. Trees not required for large woody debris recruitment may be selectively harvested.
- To maintain nutrient cycles in riparian areas adjacent to perennial and intermittent streams, there shall be no burning, piling of slash, or soil disturbance within 100 feet of active channel margins.

- To minimize sediment introduction into aquatic systems, there shall be no ground-skidding equipment within 50 feet of active channel margins in areas adjacent to perennial and intermittent streams.

See also RM-S2.

AQ-S6. Standard (cont.):

- When conducting silvicultural practices in RCAs as specified above, apply silvicultural practices only to control stocking, reestablish and culture stands, and acquire desired vegetative conditions necessary to improve RMOs.

- When conducting silvicultural practices in RCAs as specified above, do not cut or harvest any tree species older than 150 years or with a diameter at breast height greater than 20 inches. Hazard trees that fit this description may be cut, but should be left on-site.

- Where appropriate, apply silvicultural treatments to reduce the risk of severe wildfires in riparian areas that have fuel loading levels greater than expected for the biophysical setting.

AQUATIC/RIPARIAN STRATEGIES

ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7
				AQ-S6. Standard (cont.): ***Outside timber and livestock priority areas*: Zones 1, 2a, and 2b (RCA):** Same as Alternative 4.		

AQ-S6. ***Rationale:*** *For Alternatives 4, 5 (outside timber and livestock priority areas) and 6, a Riparian Conservation Area (RCA) is comprised of Zones 1, 2a, and 2b. The purpose of Zone 1 is to maintain instream and riparian processes and functions. Zone 2a is a buffer area for Zone 1 against outside disturbances and supports additional riparian area processes and functions (see Appendix G). Zone 2b is a slope-based buffer to further prevent delivery of sediment from surface erosion to the stream. Riparian Conservation Areas should not be abrupt and isolated zones due to management activities, but should grade gradually into upland areas as appropriate for the land and valley type. This is called* feathering. *Feathering RCAs refers to reducing the degree to which management activities end abruptly at the RCA boundary, thus making transitions between zones less distinct. Feathering is done to reduce edge effects, enhance stand stability, avoid abrupt transitions from one cover type to another, and restore vegetation and stand structure appropriate to the potential vegetation group. Feathering is important because the spatial arrangement and blending of these RCAs determine the function of a landscape as an ecological system.*

AQ-S7. Standard: Varies. See: A1/AQ-G1	**AQ-S7. Standard:** Same as Alternative 1, plus: A2/AQ-S1	**AQ-S7. Standard:** Not applicable.	**AQ-S7. Standard:** **Zone 1:** Vegetation management shall be conducted to achieve or maintain conditions characteristic of stream and valley types. Large trees shall be retained regardless of species where necessary to meet aquatic and riparian objectives. Activities to restore and maintain aquatic and riparian processes and functions should consider important disturbance regimes including flooding, sediment and wood transport, volcanic activity, fire, insects, and disease. Commercial timber harvest in Zone 1 shall not occur unless agreed to through interagency consultation and unless timber harvest benefits riparian management objectives.	**AQ-S7. Standard:** ***Inside timber and livestock priority areas***: Not applicable. ***Outside timber and livestock priority areas:* Zone 1:** Same as Alternative 4.	**AQ-S7. Standard:** **Zone 1:** Same as Alternative 4.	**Q-S7. Standard:** Not applicable.

AQ-S7. ***Rationale:*** *The purpose of Zone 1 is maintenance of riparian and stream functions and processes. Large trees that are living, dying, or dead (standing and downed) are important in supporting aquatic and riparian functions and processes and have high ecological value in riparian areas. Large trees are lacking in many riparian areas across the ICBEMP area. Retention of large riparian trees of any species where they are in short supply is especially important for aquatic, riparian and soil functions. Since Zone 1 is not included in the suitable timber base, there will be no emphasis for commercial production from Zone 1. If forest products are removed and sold, activities need to meet the purpose of Zone 1.*

Aquatic/Riparian Strategies

Alternative 1

AQ-S8. Standard:
Varies. See:
A1/AQ-G1
A1/TE-S13

Alternative 2

AQ-S8. Standard:
Same as Alternative 1, plus:
A2/AQ-S1

Alternative 3

AQ-S8. Standard:
Not applicable.

Alternative 4

AQ-S8. Standard:
Zone 2a: The primary purposes of Zone 2a are to provide a buffer to Zone 1 and to support additional riparian process and function. Vegetation management shall be conducted to:
- move stands toward mature and old forest conditions adapted to natural disturbance regimes as described for Zone 1 (see Tables 1 and 2 in Appendix G);
- restore and maintain riparian processes and functions;
- provide for riparian and terrestrial community needs; and
- provide a vegetative transition for Zone 1 to reduce the risks from upslope disturbance.

Alternative 5

AQ-S8. Standard:
Inside timber and livestock priority areas: Not applicable.

***Outside timber and livestock priority areas:* Zone 2a:** Same as Alternative 4.

Alternative 6

AQ-S8. Standard:
Zone 2a: Same as Alternative 4.

Alternative 7

AQ-S8. Standard:
Not applicable.

AQ-S8. *Rationale:* *Many effects of riparian vegetation on aquatic systems decline with increasing distance from stream banks. However, riparian processes and functions such as microclimate, and protection and regulation of water quality and habitat for riparian and terrestrial species extend beyond Zone 1. Zone 2 also acts as a vegetative transition and buffer to upslope disturbances for Zone 1, for example, by providing vegetation structure that can dampen the effects of upslope fire, insects, and disease on riparian areas.*

AQ-S9. Standard Varies. See: A1/AQ-G2	**AQ-S9. Standard:** Same as Alternative 1, plus: A2/AQ-S1	**AQ-S9. Standard:** Riparian Conservation Areas (RCAs) shall not be included in the suitable timber base, which is used to calculate the allowable sale quantity (ASQ).	**AQ-S9. Standard: Zones 1 and 2a:** Zones 1 and 2a shall not be included in the suitable timber base, which is used to calculate the allowable sale quantity. Zone 2b for perennial and intermittent streams may be included in the suitable timber base with vegetation management prescriptions consistent with riparian area management.	**AQ-S9. Standard:** ***Inside timber and livestock priority areas***: RCAs can be included in the suitable timber base, which is used to calculate the allowable sale quantity. ***Outside timber and livestock priority areas*: Zones 1 and 2a:** Same as Alternative 4.	**AQ-S9. Standard: Zones 1 and 2a:** Same as Alternative 4.	**AQ-S9. Standard:** Same as Alternative 2. Also applies to unroaded areas >1,000 acres allocated for the production of clean water, and aquatic- and riparian-dependent species.
			AQ-S9. *Rationale:* *Zones 1 and 2a are managed for aquatic and riparian resources, and therefore are excluded from the suitable timber base, will have no scheduled timber harvest, and will not contribute toward the calculation of current ASQ.*			
AQ-S10. Standard: Zone 2b: Varies. See: A1/AQ-G2	**AQ-S10. Standard: Zone 2b:** Same as Alternative 1, plus: A2/AQ-S1	**AQ-S10. Standard:** Not applicable.	**AQ-S10. Standard: Zone 2b:** The primary purpose of Zone 2b is to provide an additional buffer to Zones 1 and 2a. When conducting vegetation management, it shall be conducted to: - limit sediment entry and overland flow of water into Zone 2a; - provide for riparian and terrestrial community needs; - move stands toward conditions adapted to natural disturbance regimes; and - provide a vegetative transition for Zone 2a to reduce the risks from upslope disturbance.	**AQ-S10. Standard:** ***Inside timber and livestock priority areas:*** Not applicable. ***Outside timber and livestock priority areas:* Zone 2b:** Same as Alternative 4.	**AQ-S10. Standard: Zone 2b:** Same as Alternative 4.	**AQ-S10. Standard:** Not applicable.

AQUATIC/RIPARIAN STRATEGIES

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
			AQ-S10. *Rationale:* *Valley slopes adjacent to Riparian Conservation Areas (RCAs) influence the quality and condition of riparian areas. These areas, if steep and erosive, can contribute sediment to riparian areas and can also function as buffers to erosion and land use disturbances. Many variables influence the effectiveness of slopes, including steepness, erosiveness, amount of ground cover, and number and kind of obstructions. Generally steeper slopes and more erosive soils have a greater potential to contribute sediment to riparian areas.*			

Aquatic Standards - Grazing Management

Alternative 1	Alternative 2	Alternatives 3–7
AQ-S11. Standard: Varies. See: A1/AQ-G2 A1/TE-S10 A1/TE-S12 A1/TE-G8 A1/TE-G6	**AQ-S11. Standard:** Same as Alternative 1, plus: A2/AQ-S7	**AQ-S11. Standard:** The priorities for allotment management plan and grazing permit revisions shall be based on the sub-basin reviews where available (see EM-S1). The primary purpose of RCAs shall be protection, maintenance, and restoration of riparian and instream processes and functions. Vegetation management in RCAs shall be conducted to restore or maintain riparian and instream processes and functions, and to meet the intent of RCAs. ***Rationale:*** *In rangelands, an RCA is comprised of the flood-prone width, which approximates the 100-year flood plain. (See Appendix G.)*

Alternative 1	Alternative 2	Alternatives 3–4	Alternative 5	Alternative 6	Alternative 7
AQ-S12. Standard: Varies. See: A1/TE-S12 A1/TE-G8 A1/TE-G11 A1/AQ-G2 A1/AQ-O4	**AQ-S12. Standard:** Same as Alternative 1, plus: A2/AQ-S7	**AQ-S12. Standard:** Grazing management shall achieve the aquatic, riparian, and terrestrial objectives by the following actions: - If Proper Functioning Condition (PFC) is attained and Riparian Management Objectives (RMOs) have either been attained or there is measurable upward trend towards RMO attainment, then grazing prescriptions that allow measurable upward trend towards attainment or maintenance of RMOs and lentic functions and values shall continue to be used. - If PFC or RMOs have not been attained and there is not measureable progressions toward their attainment, then grazing prescriptions that will result in substantial progress toward the recovery of stream and riparian areas shall be applied. Grazing practices should be reviewed as appropriate to assure that PFC and RMOs are attained.	**AQ-S12. Standard:** ***Inside timber and livestock priority areas:*** See AQ-S2. ***Outside timber and livestock priority areas:*** Same as Alternative 4.	**AQ-S12. Standard:** Same as Alternative 4.	**AQ-S12. Standard:** Suspend grazing in RCAs adjacent to streams that do not meet RMOs if grazing is shown to be a contributing factor to the diminishment of RMOs or is a factor that limits the rate of habitat recovery. (See also TS-S24, RM-S12, RM-S14.)

		AQ-S12. *Rationale:* *The intent of this standard is to ensure that grazing prescriptions facilitate the recovery of riparian and aquatic systems. In riparian areas the purpose is to reach Proper Functioning Condition and then continue improving to meet RMOs.* **AQ-S13. Standard:**	
Varies. See: A1/AQ-G2 A1/TE-G8 A1/TE-G11 A1/TE-S12 **AQ-S13. Standard:**	Same as Alternative 1, plus: A2/AQ-S9 **AQ-S13. Standard:**	Livestock trailing, bedding, watering, loading, salting, and other handling efforts shall be limited to those areas and times that would not prevent attainment of RMOs or adversely affect aquatic resources. Livestock is limited to cattle, domestic horses, and domestic sheep that are not used for recreational purposes such as riding or packing.	
AQ-S14. Standard: Varies. See: A1/AQ-G2 A1/TE-S12	**AQ-S14. Standard:** Same as Alternative 1, plus: A2/AQ-S8	**AQ-S14. Standard:** New livestock handling and/or management facilities shall be located outside of RCAs. For existing livestock handling facilities inside RCAs, assure that facilities do not prevent attainment of RMOs. Facilities where RMOs cannot be met shall be relocated or closed.	
AQ-S15. Standard: Varies. See: A1/TE-S12	**AQ-S15. Standard:** Same as Alternative 1, plus: A2/AQ-S7	**AQ-S15. Standard:** Not applicable.	**AQ-S15. Standard:** Livestock grazing shall not occur in RCAs in or adjacent to designated critical habitat that contain perennially saturated meadows. (See also HA-O2, TS-S24, HA-S6, HA-S10.)
AQ-S16. Standard: Varies. See: A1/TE-S12	**AQ-S16. Standard:** Same as Alternative 1, plus: A2/AQ-S7	**AQ-S16. Standard:** Not applicable.	**AQ-S16. Standard:** ***Inside reserves:*** Not applicable. ***Outside reserves:*** Livestock grazing shall be suspended where riparian protection measures cannot be implemented because of: terrain; needed improvements (such as off-stream watering holes, or fencing) that are not being constructed; or lack of administration, funding, monitoring, or permittee cooperation. (See also TS-S24, RM-S12.)

Aquatic/Riparian Strategies

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
AQ-S17. Standard: Varies. See: A1/TE-G6 A1/TE-S12	**AQ-S17. Standard:** Same as Alternative 1, plus: A2/AQ-S10	**AQ-S17. Standard:** Wild horse management shall be adjusted to avoid impacts that prevent attainment of RMOs or adversely affect aquatic resources.				

Aquatic Standards - Minerals Management

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
AQ-S18. Standard: Varies. See: A1/HU-S7 A1/HU-S8 A1/HU-S9 A1/AQ-O1 A1/AQ-S1 A1/AQ-S2 A1/AQ-S3 A1/AQ-O5	**AQ-S18. Standard:** Same as Alternative 1, plus: A2/AQ-S11	**AQ-S18. Standard:** Adverse impacts to aquatic resources from locatable mineral operations should be avoided where practicable and shall be minimized in all cases. All locatable mineral operations shall comply with all pertinent federal and state laws. If a Notice of Intent indicates a mineral operation would be located in an Riparian Conservation Area (RCA) or an area that may affect an RCA, the effects of the activity on aquatic resources shall be considered in the determination of significant surface disturbance pursuant to 36 CFR 228.4 for the Forest Service and 43 CFR 3809.2-2 for the BLM. For operations in an RCA, operators shall take all practicable measures to restore and maintain fish and wildlife habitat which may be affected by the operations. Prior to beginning operations located in an RCA, under an approved plan of operations, submission of certification of compliance with laws and regulations related to mining, or other approval from other federal and state agencies, shall be required. When bonding is required, the cost of stabilizing, rehabilitating, and reclaiming the area of operations shall be considered in the estimation of bond amount.				**AQ-S18. Standard:** All new mining operations (ore body, waste rock, spent ore, tailing, roads, milling, chemical storage, housing, sand, gravel, etc.) must be located outside reserves and RCAs and must comply with all other ICBEMP standards.
AQ-S19. Standard: Varies. See: A1/HU-S7 A1/HU-S8 A1/HU-S9 A1/AQ-O1 A1/AQ-S1 A1/AQ-S2 A1/AQ-S3 A1/AQ-O5	**AQ-S19. Standard:** Same as Alternative 1, plus: A2/AQ-S12	**AQ-S19. Standard:** Structures, support facilities, and roads shall be located outside RCAs. Where no practicable alternative to siting facilities in RCAs exists, the facilities shall be located and constructed to minimize unavoidable impacts to RCAs and streams and minimize adverse effects on aquatic resources. Where no practicable alternative to road construction exists, roads shall be kept to the minimum necessary for the approved mineral activity. Those roads no longer required for current or foreseeable mineral or land management activities shall be closed, recontoured, and revegetated.				**AQ-S19. Standard:** If ongoing mining operations are located in a watershed that does not meet RMOs and if mining is shown to be a contributing factor to the diminishment of RMOs or is a factor that limits the rate of habitat recovery, then suspend special use permits to mining operations, as necessary, until problems are corrected.

AQ-S20. Standard: Varies. See: A1/HU-S8 A1/HU-S9 A1/AQ-O1 A1/AQ-S1 A1/AQ-S2 A1/AQ-S3 A1/AQ-O5	**AQ-S20. Standard:** Same as Alternative 1, plus: A2/AQ-S13	**AQ-S20. Standard:** Where no practicable alternative to locating mine waste (waste rock, spent ore, tailings) facilities in RCAs exists, these facilities should be located, designed, and managed in a manner that minimizes unavoidable adverse impacts to aquatic resources created by such mining operations, as described below. - Analyze waste material using the best conventional sampling methods and analytical techniques to determine its chemical and physical stability characteristics. - Locate and design waste facilities using the best conventional technology to ensure mass stability and prevent the release of acid or toxic materials except as in compliance with applicable pollution control or other statutes, regulations, plans and permits. Locate solid and sanitary waste facilities outside RCAs. - Monitor waste and waste facilities to confirm predictions of chemical and physical stability, and make adjustments to operations as needed to minimize unavoidable adverse impacts to aquatic resources and to attain RMOs. - Reclaim and monitor waste facilities to assure chemical and physical stability and revegetation to minimize unavoidable adverse impacts to aquatic resources, and to attain the RMOs. - Require reclamation bonds adequate to and restore, maintain, and protect fish and wildlife habitat, including measures to maintain long-term chemical and physical stability and successful revegetation, where practicable, of mine waste facilities.	**AQ-S20. Standard:** Transport and storage of toxic chemicals in watersheds occupied by federally listed threatened or endangered aquatic species shall be prohibited. In watersheds not occupied by federally listed threatened or endangered aquatic species, toxic chemical storage and transfer locations shall be in properly lined areas and shall be able to hold at least 1.5 times its storage capacity. All areas shall have proper leak detection equipment and alarms.
AQ-S21. Standard: Varies. See: A1/HU-S10 A1/HU-S11 A1/HU-S12 A1/HU-S13 A1/HU-S14 A1/HU-S15 A1/AQ-S1 A1/AQ-S2 A1/AQ-S3	**AQ-S21. Standard:** Same as Alternative 1, plus: A2/AQ-S14	**AQ-S21. Standard:** For leasable minerals (oil, gas, and geothermal), surface occupancy shall be prohibited within RCAs, unless there are no practicable alternatives for location of surface facilities, RMOs can be attained, and unavoidable adverse impacts to aquatic resources can be minimized. Where feasible, adjust the operating plans of existing leases should be adjusted to (1) minimize unavoidable impacts that prevent attainment of Riparian Management Objectives and (2) minimize unavoidable adverse impacts to aquatic resources.	**AQ-S21. Standard:** New mines that have the potential to produce acid rock drainage (either in the ore body, pregnant ore storage area, waste rock storage area, or mine tailings storage area) should not be permitted. On-going mines that have the potential to produce acid rock drainage should change their operations to avoid this problem. Otherwise these mines should have their special use permits revoked.

AQUATIC/RIPARIAN STRATEGIES

ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7
AQ-S22. Standard: Varies, See: A1/AQ-S1 A1/AQ-S2 A1/AQ-S3 A1/HU-S8	**AQ-S22. Standard:** Same as Alternative 1, plus: A2/AQ-S15	**AQ-S22. Standard:** Sand and gravel mining within RCAs should be permitted only if no practicable alternative exists, if the actions(s) will not retard or prevent attainment of RMOs, and if adverse effects to native aquatic species can be avoided.				**AQ-S22. Standard:** All mining operations shall have a completed restoration plan and be bonded sufficient to finance restoration such that affected aquatic habitats may be reestablished.
AQ-S23. Standard: Varies. See: A1/HU-S13 A1/IA-S1	**AQ-S23. Standard:** Same as Alternative 1, plus: A2/AQ-S16	**AQ-S23. Standard:** Inspection, monitoring, and reporting requirements for mineral activities shall be developed. Results of inspection and monitoring shall be evaluated and applied to modify mineral plans and permits as needed to minimize impacts that prevent attainment of RMOs and minimize unavoidable adverse effects on aquatic resources.				

Aquatic Standards - Recreation Management

ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7
AQ-S24. Standard: Varies. See: A1/HU-S2 A1/HU-S3 A1/AQ-S3	**AQ-S24. Standard:** Same as Alternative 1, plus: A2/AQ-S32	**AQ-S24. Standard:** Adverse effects from recreation facilities shall be prevented or minimized to ensure attainment of aquatic, terrestrial, and riparian objectives. Recreation facilities should be located outside of Riparian Conservation Areas. Recreation facilities may be located in RCAs only after all other practicable alternatives have been eliminated and Ecosystem Analysis at the Watershed Scale has been completed. For construction of minor recreation facilities that would create only transient effects and are in watersheds that do not require Ecosystem Analysis at the Watershed Scale, sub-basin review shall be used, where available, along with site-specific NEPA analysis. Also applies to RM-O2.		**AQ-S24. Standard:** ***Inside recreation priority areas:*** Adverse effects from recreation facilities shall be prevented or minimized to ensure attainment of aquatic, terrestrial, and riparian objectives. ***Outside recreation priority areas:*** Same as Alternative 3.	**AQ-S24. Standard:** Same as Alternative 3.	**AQ-S24. Standard:** ***Inside reserves:*** Not applicable. ***Outside reserves:*** Same as Alternative 3.

AQ-S24. ***Rationale:*** *The primary purpose of RCAs is the restoration and maintainence of riparian and instream processes and functions. It is, therefore, expected that recreation facilities will be located outside RCAs. Information from Ecosystem Analysis at the Watershed Scale, as appropriate, may identify exceptions. An intergovernmental collaborative process would help to ensure that exceptions do not compromise the purpose and function of the RCA.*

AQ-S25. Standard: Varies. See: A1/HU-S2 A1/HU-S3 A1/AQ-S3	**AQ-S25. Standard:** Same as Alternative 1, plus: A2/AQ-S31	**AQ-S25. Standard:** Recreation facilities (including trails) and dispersed sites, shall be designed, constructed, and operated in a manner that does not retard or prevent attainment of RMOs and avoids effects on aquatic resources.	**AQ-S25. Standard:** ***Inside recreation priority areas:*** Recreation facilities (including trails) and dispersed sites, shall be designed, constructed, and operated in a manner that is consistent with attainment of RMOs. ***Outside recreation priority areas:*** Same as Alternative 3.	**AQ-S25. Standard:** Same as Alternative 3.	**AQ-S25. Standard:** Same as Alternative 3.
AQ-S26. Standard: Varies. See: A1/HU-S2 A1/HU-S3 A1/AQ-S3	**AQ-S26. Standard:** Same as Alternative 1, plus: A2/AQ-S33	**AQ-S26. Standard:** For existing recreation facilities inside RCAs, assure that facilities or use of facilities shall not prevent attainment of RMOs or adversely affect native aquatic species. Where RMOs cannot be met or adverse effects on aquatic resources cannot be avoided, recreation facilities shall be relocated or closed.	**AQ-S26. Standard:** ***Inside recreation priority areas:*** Existence or use of facilities inside RCAs shall be consistent with attainment of RMOs. ***Outside recreation priority areas:*** Same as Alternative 3.	**AQ-S26. Standard:** Same as Alternative 3.	**AQ-S26. Standard:** Same as Alternative 3.
AQ-S27. Standard: Varies. See: A1/HU-S2 A1/HU-S3 A1/AQ-S3	**AQ-S27. Standard:** Same as Alternative 1, plus: A2/AQ-S30	**AQ-S27. Standard:** Fish and wildlife interpretive and other user-enhancement facilities shall be designed, constructed, and operated in a manner that does not retard or prevent attainment of RMOs or adversely affect aquatic resources. For existing fish and wildlife interpretive and other user-enhanced facilities inside RCAs, assure that RMOs are met and adverse effects on aquatic resources are avoided. Where RMOs cannot be met or adverse effects on aquatic resources avoided, such facilities shall be relocated or closed.	**AQ-S27. Standard:** ***Inside recreation priority areas:*** New and existing fish and wildlife interpretive and other user-enhancement facilities within RCAs shall be designed, constructed, and operated in a manner that is consistent with attainment of RMOs. ***Outside recreation priority areas:*** Same as Alternative 3.	**AQ-S27. Standard:** Same as Alternative 3.	**AQ-S27. Standard:** Same as Alternative 3.

Aquatic/Riparian Strategies

Alternative 1

AQ-S28. Standard: Varies. See:
A1/HU-S2
A1/HU-S3
A1/AQ-S3

Alternative 2

AQ-S28. Standard: Same as Alternative 1, plus:
A2/AQ-S34

Alternative 3

AQ-S28. Standard: Dispersed and developed recreation practices that retard or prevent attainment of RMOs or adversely affect aquatic resources shall be adjusted. Where adjustment measures such as education, use limitations, traffic control devices, increased maintenance, relocation of facilities, and/or specific site closures are not effective in meeting RMOs and avoiding adverse effects on aquatic resources, the practice or occupancy shall be eliminated.

Alternative 4

(AQ-S28 in Alternative 4 shares the Alternative 3 text above.)

Alternative 5

AQ-S28. Standard: ***Inside recreation priority areas:*** Dispersed and developed recreation practices shall be consistent with attainment of RMOs.

Outside recreation priority areas:
Same as Alternative 3.

Alternative 6

AQ-S28. Standard: Same as Alternative 3.

Alternative 7

AQ-S28. Standard: Same as Alternative 3.

Aquatic Standards - Fire Suppression/Fuels Management

AQ-S29. Standard: (Alternative 1) Varies. See:
A1/AQ-S1
A1/AQ-S3
A1/TE-G1
A1/TE-G3

AQ-S29. Standard: (Alternative 2) Same as Alternative 1, plus:
A2/AQ-S17

AQ-S29. Standard: (Alternatives 3–6) Fuel treatment and fire suppression strategies, practices, and actions shall be designed so as to not prevent attainment of RMOs, and to minimize disturbances of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuel management actions could perpetuate or be damaging to long-term ecosystem function or aquatic resources.

AQ-S29. Standard: (Alternative 7) Impacts from suppression techniques and fire suppression personnel shall be minimized or avoided in areas where there is potential to adversely affect listed salmon, other riparian-dependent species, and their habitats. Every effort should be made to minimize or avoid stream channel and stream course disturbances, sedimentation, and actions that will result in increased water temperature.

AQ-S30. Standard: Varies. See: A1/AQ-O5 A1/TE-S20 A1/TE-S21 A1/TE-S22	**AQ-S30. Standard:** Same as Alternative 1.	**AQ-S30. Standard:** Not applicable.	**AQ-S30. Standard:** The following shall apply to fire suppression activities: - Heavy equipment shall not be used within RCAs, except for the protection of life and property. - Other than hazard trees, trees shall not be felled within RCAs. - When constructing fire lines and transportation routes, avoid reopening revegetated roads within RCAs.
AQ-S31. Standard: Varies. See: A1/AQ-S1 A1/AQ-S3 A1/AQ-G1 A1/TE-G1	**AQ-S31. Standard:** Same as Alternative 1, plus: A2/AQ-S18	**AQ-S31. Standard:** Incident bases, camps, helibases, staging areas, helispots, and other centers for incident activities shall be located outside of RCAs. If the only suitable location for such activities is within the RCAs, an exemption may be granted following a review and recommendation by a resource advisor. The advisor would prescribe the location, use conditions, and rehabilitation requirements, with avoidance of adverse effects to aquatic resources a primary goal. An interdisciplinary team shall be used to predetermine incident base and helibase locations during pre-suppression planning	**AQ-S31. Standard:** An aquatics specialist shall be involved in the development of the Fire Situation Analysis (FSA) and the Escaped Fire Situation Analysis (EFSA), serving with or as the resource advisor. Locations for fire camps, staging areas, and fire base heliports shall be located outside RCAs wherever possible. An aquatics specialist shall be readily available to the Incident Commander and shall review shift plans to assess the potential effects of planned actions on aquatic species and habitat.

Aquatic/Riparian Strategies

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
AQ-S32. Standard: Varies. See: A1/AQ-S1 A1/AQ-S3 A1/TE-G1	**AQ-S32. Standard:** Same as Alternative 1, plus: A2/AQ-S19	**AQ-S32. Standard:** Delivery of chemical retardant, foam, or additives to surface waters shall be prohibited. An exception may be warranted in situations where overriding immediate safety imperatives exist, or, following a review and recommendation by a resource advisor, when the action agency determines an escaped fire would cause more long-term damage to fish habitats than chemical delivery to surface waters.				**AQ-S32. Standard:** Use of fire retardant chemicals and fuels shall be prohibited when potential for stream or wetland contamination exists.
AQ-S33. Standard: Varies. See: A1/AQ-S1 A1/AQ-S3 A1/TE-G2	**AQ-S33. Standard:** Same as Alternative 1, plus: A2/AQ-S20	**AQ-S33. Standard:** Prescribed burn projects and prescriptions shall be consistent with attainment of RMOs.				
AQ-S34. Standard: Varies. See: A1/TE-G2 A1/AQ-S1 A1/AQ-S2 A1/TE-S22 A1/TE-G12	**AQ-S34. Standard:** Same as Alternative 1, plus: A2/AQ-S1 A2/AQ-S20	**AQ-S34. Standard:** Not applicable.				**AQ-S34. Standard:** Burnout or backfire operations that increase fire intensities shall be prohibited within riparian habitat.
AQ-S35. Standard: Varies. See: A1/AQ-S3 A1/TE-S1 A1/TE-S2 A1/AQ-S3	**AQ-S35. Standard:** Same as Alternative 1, plus: A2/AQ-S21	**AQ-S35. Standard:** A team shall be established to develop a rehabilitation treatment plan to attain RMOs and avoid adverse effects on aquatic resources whenever RCAs are significantly damaged by a wildfire or a prescribed fire burning out of prescription.				**AQ-S35. Standard:** A rehabilitation team shall be assigned to all fires affecting aquatic resources. An aquatics specialist shall be assigned to emergency and non-emergency rehabilitation teams.

AQ-S35. Standard (cont.): Fire lines shall be water barred, seeded (preferably with native species), and otherwise treated to reduce erosion as they are completed.

An aquatics specialist shall review suppression and rehabilitation efforts to determine whether requirements and tactics identified in the FSA or EFSA were successfully implemented, and if the revegetation and rehabilitation of the burned area were successful.

When large fires affect more than ten percent of a subwatershed, a group of scientific experts shall be convened to prepare or update a peer-reviewed ecosystem analysis describing the short- and long-term effects from wildfire, fire suppression directions and actions, and area revegetation and rehabilitation. The team shall be composed of scientists from federal land management and regulatory agencies. Following the analysis the group should recommend additional appropriate actions for the burned or unburned areas within the watershed.

Aquatic/Riparian Strategies

Aquatic Standards - Lands/Permits/Facilities

<table>
<tr><th>Alternative 1</th><th>Alternative 2</th><th>Alternative 3</th><th>Alternative 4</th><th>Alternative 5</th><th>Alternative 6</th><th>Alternative 7</th></tr>
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<td>AQ-S36. Standard: Varies. See: A1/AQ-S1</td>
<td>AQ-S36. Standard: Same as Alternative 1, plus: A2/AQ-S22</td>
<td colspan="4">AQ-S36. Standard: For hydroelectric and other surface water development proposals, instream flows and habitat conditions that provide for maintenance of recreation opportunities, and restore or maintain riparian resources, favorable conditions of flow, and fish passage, reproduction, and growth shall be required. These flows shall be determined by analysis of the resources at the appropriate ecosystem scale. When flows are being determined for hydroelectric proposals, this analysis shall be coordinated with state and federal agencies that have authorities under Section 10 of the Federal Power Act. During licensing or relicensing of hydroelectric projects, stipulations (in Section 4(e) of the Federal Power Act) that achieve aquatic and riparian management objectives shall be submitted to the Federal Energy Regulatory Commission.</td>
<td>AQ-S36. Standard: Issuance of additional water conveyance permits shall be prohibited in watersheds that support fish spawning/rearing habitat until instream flows are documented and shown to be adequate to accommodate both the needs of aquatic and riparian-dependent species and the amount of water being conveyed. The needs of fish are defined as those instream flows necessary to optimize all RMOs and essential features of habitat.</td>
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AQ-S37. Standard: Varies. See: A1/AQ-S3	**AQ-S37. Standard:** Same as Alternative 1, plus: A2/AQ-S22	**AQ-S37. Standard:** Not applicable.	**AQ-S37. Standard:** Peer-reviewed ecosystem analysis shall be completed prior to issuing water conveyance permits. The ecosystem analysis and peer-review results shall agree that the water conveyance and its effects will not prevent attainment of RMOs or the maintenance or recovery of aquatic and riparian-dependent species. Where instream flows are inadequate to accommodate both the needs of aquatic and riparian-dependent species and RMOs and the amount of water being conveyed, new conveyance permits shall not be issued, and those conveyance permits already issued shall be revoked.
AQ-S38. Standard: Varies. See: A1/AQ-S3	**AQ-S38. Standard:** Same as Alternative 1, plus: A2/AQ-S22	**AQ-S38. Standard:** Not applicable.	**AQ-S38. Standard:** Instream flow requirements to meet the needs of aquatic and riparian-dependent species, shall be determined and established.
AQ-S39. Standard: Varies. See: A1/AQ-S2	**AQ-S39. Standard:** Same as Alternative 1, plus: A2/AQ-S22	**AQ-S39. Standard:** Not applicable.	**AQ-S39. Standard:** All water conveyances across federal land shall be catalogued and compared against state-granted water rights. Those without state water rights shall have their conveyance permits revoked.

AQUATIC/RIPARIAN STRATEGIES

ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7
AQ-S40. Standard: Varies. See: A1/IA-S1 A1/AQ-S3	**AQ-S40. Standard:** Same as Alternative 1, plus: A2/AQ-S24	**AQ-S40. Standard:** Not applicable.				**AQ-S40. Standard:** All water conveyance intakes shall meet established standards, or conveyance permits shall be revoked.
AQ-S41. Standard: Varies. See: A1/AQ-S2	**AQ-S41.** Standard: Same as Alternative 1, plus: A2/AQ-S22	**AQ-S41.** Standard: Not applicable.				**AQ-S41. Standard:** All water conveyance permits shall require the permittee to use the best methodology to conserve water during conveyance.
AQ-S42. Standard: Varies. See: A1/AQ-S2	**AQ-S42. Standard:** Same as Alternative 1, plus: A2/AQ-S22	**AQ-S42. Standard:** During licensing of hydroelectric projects, stipulations shall be submitted to the Federal Energy Regulatory Commission (FERC; as required under Section 4[e] of the Federal Power Act) requiring that existing ancillary facilities shall not prevent attainment of RMOs. Where this stipulation cannot be met, such facilities shall be relocated. **Rationale:** *Ancillary facilities are those features of a hydroelectric or other project that are not integral to its functioning. Such facilities include parking and staging areas, switchyards, interpretive facilities, etc. Diversion structures, pipelines or penstocks and powerhouses are generally not considered to be ancillary facilities.*				
AQ-S43. Standard: Varies. See: A1/AQ-S3	**AQ-S43. Standard:** Same as Alternative 1, plus: A2/AQ-S23	**AQ-S43. Standard:** Developments of new facilities that may adversely affect RCAs should not be permitted. New development proposals that address public needs or provide significant public benefits, such as power lines, pipelines, reservoirs, recreation sites, or other public works, shall be reviewed on a case-by-case basis. They may be approved when adverse effects can be minimized and mitigated, and when they are consistent with existing laws and regulations. These shall be planned to have the fewest possible impacts on RCAs. Developments shall be located to avoid degradation of habitat and adverse affects on RCAs. Existing developments in RCAs such as campgrounds, recreation residences, ski areas, utility corridors, and electronic sites, are considered existing uses with respect to RCA objectives and values, and may remain, subject to being consistent with other ICBEMP standards and objectives, as long as their purpose, use, and safety requirements are met. **Rationale:** *Many existing facilities are and have been located within RCAs for many years. These facilities are the result of choices and investments associated with local or site-specific decisions, development plans, permits, or other conveyances. This EIS is generally aimed at addressing landscape and watershed level issues, not site-specific facilities. As these facilities are operated, they shall comply with existing laws, regulations and policies.*				

AQ-S44. Standard: Varies. See: A1/AQ-S3	**AQ-S44. Standard:** Same as Alternative 1, plus: A2/AQ-S24	**AQ-S44. Standard:** Leases, permits, rights-of-way, and easements shall be issued to avoid effects that would be inconsistent with or prevent attainment of the RMOs and to avoid adverse effects on aquatic resources. Where the authority to do so was retained, existing leases, permits, rights-of-way, and easements should be adjusted to eliminate effects that would retard or prevent attainment of the RMOs or adversely affect aquatic resources. If adjustments are not effective, the activity shall be eliminated. Where the authority to adjust was not retained, changes in existing leases, permits, rights-of-way, and easements shall be negotiated to eliminate effects that would prevent attainment of the RMOs or adversely affect aquatic resources. Priority for modifying existing leases, permits, rights-of-way, and easements would be based on the current and potential adverse effects on aquatic resources and the ecological value of the riparian resources affected.	**AQ-S44. Standard:** Not applicable.

Aquatic Standards - Additional Riparian Area Management

AQ-S45. Standard: Varies. See: A1/AQ-S1 A1/AQ-S2	**AQ-S45. Standard:** Same as Alternative 1, plus: A2/AQ-S26	**AQ-S45. Standard:** Not applicable.	**AQ-S45. Standard:** Transport of toxic chemicals along aquatic and riparian-dependent species migration, rearing, and spawning streams and their tributary streams should be either eliminated or the risk of a toxic spill reduced to an insignificant level.

AQ-S46. Standard: Each land management unit shall develop a contingency plan identifying procedures to be initiated should a chemical spill or contamination occur, and a plan and schedule for principal personnel to receive chemical spill training in initiating and completing the contingency plan.

AQ-S47. Standard: Varies. See: A1/AQ-S3	**AQ-S47. Standard:** Same as Alternative 1, plus: A2/AQ-S25	**AQ-S47. Standard:** Herbicides, pesticides, and other toxicants and chemicals shall be applied in a manner that does not retard or prevent attainment of RMOs and avoids adverse effects on aquatic resources.
AQ-S48. Standard: Varies. See: A1/AQ-S1 A1/AQ-S2	**AQ-S48. Standard:** Same as Alternative 1, plus: A2/AQ-S26	**AQ-S48. Standard:** Storage of fuels and other toxicants shall be prohibited within RCAs. Refueling shall be prohibited within RCAs unless there are no other alternatives. Refueling sites within RCAs and spill containment plans shall be approved.

AQUATIC/RIPARIAN STRATEGIES

ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7
AQ-S49. Standard: Varies. See: A1/AQ-S1 A1/AQ-S2	**AQ-S49. Standard:** Same as Alternative 1, plus: A2/AQ-S27	**AQ-S49. Standard:** Water drafting sites shall be located to avoid adverse effects on aquatic resources and instream flows, and in a manner that does not retard or prevent attainment of RMOs.				
AQ-O11. Objective: Varies. See: A1/AQ-O3 A1/AQ-O5 A1/TE-G8	**AQ-O11. Objective:** Same as Alternative 1, plus: A2/AQ-O4	**AQ-O11. Objective:** Manage grazing in wetland areas to minimize soil compaction, maintain vegetative cover, and maintain native and desired non-native species composition in order to prevent impairment of wetland functions and values.				
AQ-O12. Objective: Varies. See: A1/TE-G8 A1/AQ-O2	**AQ-O12. Objective:** Same as Alternative 1, plus: A2/AQ-O1	**AQ-O12. Objective:** Manage grazing and human activities to minimize disturbance of redds for candidate and sensitive species.				
AQ-S50. Standard: Varies. See: A1/TE-G8 A1/TE-G11 A1/AQ-S3 A1/AQ-G1	**AQ-S50. Standard:** Same as Alternative 1, plus: A2/AQ-S7	**AQ-S50. Standard:** Livestock access shall be managed to prevent unauthorized (under the Endangered Species Act) physical disturbance to redds for threatened, endangered, and proposed species of fish. Incidental disturbance to threatened or endangered species in some cases may be authorized through the consultation or conferencing process.				

AQ-S51. Standard: Varies. See: A1/TE-G8 A1/TE-G11 A1/AQ-S3 A1/AQ-G1	**AQ-S51. Standard:** Same as Alternative 1. plus: A2/AQ-S7	**AQ-S51. Standard:** Livestock access and human activities shall be managed to take all reasonable measures to minimize adverse impacts on redds for candidate and sensitive species. ***Rationale:*** *Redds for candidate and sensitive species (redband trout, westslope cutthroat, and Yellowstone cutthroat trout) are susceptible to disturbance by livestock and human activities. Occurrence of these species should alert managers to adjust management actions accordingly to minimize impacts.*

Water Quality

AQ-O13. Objective: Varies. See: A1/AQ-O1 A1/AQ-S1 A1/HU-O6 A1/HU-O7	**AQ-O13.** Objective: Same as Alternative 1.	**AQ-O13.** Objective: Maintain water quality where it presently meets EPA-approved state and, as applicable, EPA-approved tribal water quality standards (that is, designated instream uses and the level of water quality necessary to protect the uses). Improve water quality where it does not meet EPA-approved state and, as applicable, EPA-approved tribal water quality standards due to management on Forest Service- or BLM-administered lands. ***Rationale:*** *Mandates of the Clean Water Act establish the EPA as administrator and states as implementors of the Act. The states designated the Forest Service and BLM to manage the requirements of the Clean Water Act on lands they administer, but primacy in implementing the Clean Water Act is retained by the states. The EPA has final approval of state water quality standard and responsibility of other Clean Water Act mandates. The Clean Water Act authorizes the EPA to treat an Indian tribe as a state for purposes of carrying out requirements of the Act, including establishment of water quality standards on tribal lands. Once approved by EPA, the standards become the applicable standards for tribal waters.*

AQ-S52. Standard: Where Outstanding Resource Waters are designated by a state or tribe, existing water quality shall be maintained.

Rationale: *This standard requires the Forest Service and BLM to continue to comply with existing state law. Few waters are currently designated as Outstanding Resource Waters (no water in Idaho is currently designated as such, although two water bodies have been recommended to the legislature for legal designation). In Idaho, under Title 39, Chapter 36 of the Health and Safety code, once a water is officially designated as an Outstanding Resource Water, existing activities may continue and shall restore and maintain the current water quality. New or existing nonpoint source activities can be conducted only if they do not lower water quality; an exception would be for short-term or temporary actions that do not alter the character of the water.*

AQ-S53. Standard: Where waters exceed applicable water quality standards, state or tribal anti-degradation requirements shall be met.

AQ-S54. Standard: Within watersheds with Water Quality Limited Segments (as defined by Section 303(d) of the Clean Water Act) management activities shall be implemented in compliance with state-developed or, when applicable, EPA-developed total maximum daily loads (TMDLs) with the intent to restore water quality to meet state or tribal water quality standards. Provide an early opportunity for intergovernmental collaboration in the development of TMDLs.

AQ-S55. Standard: Not applicable.	**AQ-S55. Standard:** Not applicable.	**AQ-S55. Standard:** The state Priority Lists for Water Quality Limited Segments shall be incorporated into the intergovernmental prioritization process at the sub-basin and watershed scales. (See also EM-S3, EM-S1.)

AQUATIC/RIPARIAN STRATEGIES

ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVES 3, 4, 5, 6, 7
AQ-S56. Standard: Varies. See: A1/AQ-S2 A1/AQ-S3 A1/AQ-G2	**AQ-S56. Standard:** Same as Alternative 1.	**AQ-S56. Standard:** Where EPA-approved state and, as applicable, EPA-approved tribal water quality standards are not being met due to management on Forest Service- or BLM-administered lands, management activities shall be adjusted as necessary to meet water quality standards. Adjustments shall be documented and coordinated with the appropriate state agencies and/ or tribal governments. ***Rationale:*** *Tribes and states are both considered by the EPA to be implementors of the Clean Water Act under Section 518. Tribal water quality standards would be developed for waters on lands in a Reservation, not for waters outside Reservations, and would be sent to EPA for approval. Court decisions indicate that landowners upstream of Reservations with approved water quality standards would have to abide by those standards. There are currently three EPA-approved Tribal water quality standards in the project area, all in Washington. Other Tribes are in the process of developing standards. Proposed standards or changes to standards by states or tribes require public review and must be scientifically based as part of the approval process.*
AQ-O14. Objective: Varies. See: A1/AQ-O1	**AQ-O14. Objective:** Same as Alternative 1.	**AQ-O14. Objective:** Restore Water Quality Limited Segments by developing recommended management actions that are supported by ecosystem analysis at an appropriate scale, to assist states in: 1) listing and delisting Water Quality Limited Segments 2) establishment of phased total maximum daily loads for validated Water Quality Limited Segment waterbodies. ***Rationale:*** *Ecosystem analysis establishes a consistent context for water quality conditions and protection of beneficial uses. Ecosystem Analysis at the Watershed Scale provides the hydrologic characterization, identification of pollutant sources, and restoration capabilities in the watershed which is a fundamental step in accurate development of TMDLs. Recommendations from Ecosystem Analysis will be incorporated into the management actions to restore or mitigate contributing sources of water pollution from lands administered by the Forest Service or BLM. In the absence of Ecosystem Analysis, develop recommendations from site-specific NEPA analysis before finalizing EA/EISs using the following tools:* A Framework for Analyzing the Hydrologic Condition of Watersheds; Water Quality Modules *(draft document for developing the hydrologic portion of the Ecosystem Analysis); supplements to the* Federal Guide for Ecosystem Analysis at the Watershed Scale; *and available water quality data.*

TERRESTRIAL AND AQUATIC SPECIES AND HABITATS

ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7
HA-O1. Objective: Varies. See: A1/HU-O6	**HA-O1. Objective:** Same as Alternative 1 plus: A2/AQ-O1 A2/AQ-O2 A2/AQ-O3 A2/AQ-O4	**HA-O1. Objective:** Restore and/or maintain habitat conditions at or above a level capable of supporting healthy, sustainable, and usable species and resources to meet the federal government's responsibility. (See also HA-O2) ***Rationale:*** *A primary concern of Indian tribes is how the federal government will fulfill its trust responsibilities assumed when treaties, executive orders, and agreements were signed. At issue is the availability of trust resources in sufficient quantities to allow harvests in accordance with those agreements. This includes ceremonial, subsistence, social, and commercial needs of tribes. In light of federal trust responsibilities, managing habitat for resources to which tribes have a reserved right to access becomes more important. American Indians continue to practice cultural traditions on federal lands to maintain their community socioeconomic well-being and cultural survival. (See Appendix C.)*				

Viable Populations

ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7
HA-O2. Objective: Varies. See: A1/TE-O6 A1/AQ-O2	**HA-O2. Objective:** Same as Alternative 1 plus: A2/AQ-O1	**HA-O2. Objective:** Provide habitat capable of (1) supporting viable populations of plant and animal species, (2) contributing to recovery of listed species, and (3) supporting productive and diverse plant and animal populations and communities to meet social needs. Management, including restoration, of habitat should include consideration of riparian areas, lentic wetlands, and upland forest, shrub and grassland habitats. Amount, quality, and distribution of these habitats should be considered including their fragmentation, juxtaposition to other habitats, and connectedness; the influence of roads; and the ecosystem processes that shape habitat. For scarce habitats, management should focus on restoration of degraded areas capable of becoming high quality and areas that are currently of high quality. In all habitat management activities, recognize the importance of species functions, native species assemblages, centers of biodiversity, endemic plants and animals, rare plants and animals, disjunct vertebrates, and species that occur at the edge of their ranges. ***Rationale:*** *A viable population has the estimated numbers and distribution of reproductive individuals (both current and projected) to provide for a self-sustaining population with a sufficiently high likelihood of continued existence at a high enough level that listing of the species under the Endangered Species Act does not become warranted. A "recovered" listed species is considered to be viable when it is removed from the Endangered Species list. (See Appendix K.)* *Habitat restoration could focus on aspen communities, planting and regeneration of cottonwood and willow, and regeneration of shrub species, as appropriate to the biophysical environment. Attention should be given to maintaining species, species assemblages, and ecosystems at the edge of their ranges in the project area. Such peripheral areas often provide locations important for genetic diversity and evolution.* *A population that meets social needs is one whose current and projected distribution and numbers allow human uses while sustaining and / or increasing plant and animal population levels. See Chapter 2 for further discussion. (Note: Further refinement of terrestrial species needs will likely occur prior to releasing the Final EIS.)*				

Terrestrial and Aquatic Species and Habitats

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
HA-S1. Standard: Varies. See: A1/TE-S19	**HA-S1. Standard:** Same as Alternative 1 plus: A2/AQ-S11	**HA-S1. Standard:** Habitats shall be managed to foster long-term viable populations, in full recognition of the ecological importance of assemblages of species with known viability concerns. Special management emphasis shall be on the edges of these species ranges where the highest levels of species variation and adaption occurs.				
HA-S2. Standard: Varies. See: A1/TE-S13 A1/TE-S16 A1/TE-S17 AQ-TE-G8	**HA-S2. Standard:** Same as Alternative 1.	**HA-S2. Standard:** Management activities shall: 1) foster restoration of vegetation structure and composition, 2) foster restoration of linkage zones, and 3) increase patch size within and between similar habitats, to reduce fragmentation and to provide for viable populations of terrestrial species. Fragmentation shall be reduced within dry shrub, cool shrub, dry grass, and late/old forest where special status species occur.		**HA-S2. Standard:** ***Inside wildlife priority areas:*** Same as Alternative 3. ***Outside wildlife priority areas:*** Not applicable	**HA-S2. Standard:** Same as Alternative 3.	**HA-S2. Standard:** Same as Alternative 3.

Rationale: *These plant communities are highly departed in frequency, connectivity, and composition from historical levels and conditions. Consequently associated species of native flora and fauna have declined or been locally extirpated. Several of these species are of major management concern.*

HA-S3. Standard: Not Applicable	**HA-S3. Standard:** Not Applicable	**HA-S3. Standard:** Terrestrial species habitats shall be restored or maintained so that terrestrial species can move freely within and between blocks of habitats for the purpose of genetic interchange, emigration, and immigration.	**HA-S3. Standard:** ***Inside wildlife priority areas:*** Same as Alternative 3. ***Outside wildlife priority areas:*** Not applicable	**HA-S3. Standard:** Same as Alternative 3.	**HA-S3. Standard:** ***Inside reserves:*** Same as Alternative 3. ***Outside reserves:*** Not applicable.
		Rationale: *The frequency, connectivity, and composition of forestlands and rangelands are vastly different from historical levels and conditions. This is especially true in multi- and single-layer late/old forest and native rangelands. Restoration of late/old forest and native rangelands is needed to improve their frequency and connectivity and to allow wildlife species to move freely between blocks of these habitat types.*			
HA-S4. Standard: Not Applicable	**HA-S4. Standard:** Not Applicable	**HA-S4. Standard:** At known habitat bottlenecks, manage to improve/restore linkages between and within blocks of federal land ownership. Land exchanges should be used to mitigate "bottleneck" problems.	**HA-S4. Standard:** ***Inside wildlife priority areas:*** Same as Alternative 3. ***Outside wildlife priority areas:*** Not applicable.	**HA-S4. Standard:** Same as Alternative 3.	**HA-S4. Standard:** Same as Alternative 3.
		Rationale: *The Terrestrial Staff of the Science Integration Team analyzed the project area and developed a map of habitat "bottlenecks" considering all potential vegetation groups. These bottlenecks tend to occur where major interstate freeways or state highways cross large mountain ranges (for example, Snoqualmie Pass and Lolo Pass). Federal ownership decreases along the transportation corridors where they cross the mountains. The change in ownership from federal to private lands results in significant changes in vegetation patterns in those areas, as well as major barriers to natural movements of wildlife species. One method of addressing the change in land use pattern is conducting mutually acceptable land exchanges in areas with known bottlenecks.*			
HA-S5. Standard: Varies. See: A1/TE-S13	**HA-S5. Standard:** Same as Alternative 1.	**HA-S5. Standard:** Forest Service Regional and BLM State offices shall develop mature / old forest structural definitions and criteria for all potential vegetation types, taking into account local site conditions, using ranges for the following attributes, at a minimum: - number of large trees (including those necessary for future snag recruitment), - number of snags, - amount of downed woody material, - amount and size of gaps / openings, - number of canopy layers, - native shrub / herb components.			

TERRESTRIAL AND AQUATIC SPECIES AND HABITATS

ALTERNATIVE 1

HA-S6. Standard: Varies. See: A1/TE-S13

ALTERNATIVE 2

HA-S6. Standard: Same as Alternative 1.

ALTERNATIVE 3 / ALTERNATIVE 4

HA-S6. Standard: Administrative units (Forest/ BLM District level or higher) should conduct analyses and produce strategies to provide for adequate distribution, occurrence, and connectivity of mature/old structure stands. Analysis should be part of ecosystem analysis (see EM-O1 and EM-O3). In the absence of this analysis, the following apply: Retain large remnant trees in mature and old, single- and multi-layer stands 100 acres or larger consistent with the desired range of future conditions (Tables 3-1 and 3-2). Ensure that mature/old stands are connected within the watersheds and similar stands in adjacent watersheds. This connectivity should be in a contiguous network pattern in two or more directions. Ensure that mature/old structures are connected by stands in which medium diameter or larger trees are common and canopy closures are within the top 1/3 of site potential. Stand widths should be at least 400' at their narrowest point. The only exception to stand width is when it is unlikely to meet 400 feet with current vegetative structure and these narrower stands are the only connections available. In the case of lodgepole pine, consider medium to large trees as appropriate diameters to this stand type.

ALTERNATIVE 5

HA-S6. Standard: ***Inside wildlife priority areas:*** Same as Alternative 3.

Outside wildlife priority areas: Administrative units should conduct analyses and produce strategies to provide for adequate distribution, occurrence, and connectivity of mature/old structure stands. Analysis should be part of ecosystem analysis. (See also EM-O1 and EM-O3.)

ALTERNATIVE 6

HA-S6. Standard: Same as Alternative 5 outside wildlife priority areas.

ALTERNATIVE 7

HA-S6. Standard: ***Inside reserves:*** See TS-S14 and TS-S20 for direction.

Outside reserves: Same as Alternative 3.

Rationale: The Landscape Dynamics *(Hann et al. 1996)* chapter of the AEC *found that in most cases the current amount of late-seral forest ecosystems is below the historic range of variability. As a whole, the project area appears to be more fragmented than the historical landscape, with indices for large patches and mean patch size decreasing.*

HA-S7. Standard: Varies. See: A1/TE-S14	**HA-S7. Standard:** Same as Alternative 1.	**HA-S7. Standard:** Prior to conducting vegetation management actions that have potential effect on existing snag levels and recruitment, administrative units (Forest/ BLM District level or higher) shall review existing or conduct new local snag analysis to develop standards appropriate for local conditions using current information from the literature, to ensure snag determinations meet species needs. This analysis shall address snag numbers, diameter, height, decay class, species, and distribution. Snags should be well distributed throughout the landscape and, where possible, left as patches. It is desirable to leave green replacement trees in the same patches. Snag determinations shall be patterned after historical conditions for vegetation communities and include consideration of wildlife species needs and current conditions. Locally developed standards shall specify how snags are to be treated under all types of management actions (for example, harvest, thinning, salvage, and prescribed fire). In the absence of this analysis, the following shall be provided (applies to lands where forest management activities occur). In areas where these numbers are not attainable, provide amounts as close as possible, substitute other species where possible to meet numbers listed, and document why conditions cannot be met. (See also PE-S1 and PE-S3.) **Dry Forest** Ponderosa pine with >30% canopy closure — 4 snags acre > 10" dbh, 25+% of these > 20" dbh Ponderosa pine with <30% canopy closure because of dry sites — 2 snags / acre > 10" dbh, 25+% of these > 20" dbh Grand fir / Douglas fir On pine sites — 4 snags / acre > 10" dbh, 25+% of these > 20" dbh **Moist Forest** Mixed conifer — 6 snags / acre > 10" dbh, 25+% of these > 20" dbh **Cold Forest** Lodgepole pine — 6 snags / acre > 10" dbh Spruce / Fir — 6 snags / acre > 10" dbh, 25+% of these > 20" dbh	**HA-S7. Standard:** ***Inside timber and livestock priority areas:*** Develop snag standards appropriate for local conditions and management priority. ***Outside timber and livestock priority areas:*** Same as Alternative 3.	**HA-S7. Standard:** Same as Alternative 3.	**HA-S7. Standard:** Same as Alternative 3.

HA-S7. Rationale: *This standard is not intended to require another level of analysis, but, rather to include snags in site-specific NEPA analysis that normally occurs prior to vegetation management. Emphasis is on retainment of snags, default snag numbers are listed as a starting point, with the acknowledgement that administrative units could and should develop more appropriate numbers with local data or analysis.*

Terrestrial and Aquatic Species and Habitats

Alternative 1

HA-S8. Standard: Varies. See: A1/TE-S15

Alternative 2

HA-S8. Standard: Same as Alternative 1.

Alternative 3

HA-S8. Standard: Prior to conducting vegetation management actions that have potential effect on existing downed wood levels, administrative units (Forest/ BLM District level or higher) shall review existing or conduct local analysis to develop standards appropriate for local conditions using current information from the literature, to ensure downed wood determinations meet species needs. This analysis shall address average not minimum downed wood amounts and size (diameter and length) of pieces by potential vegetation group, distribution, species, and replacement through time. Downed wood determinations shall be patterned after historic conditions for vegetation communities and include consideration of wildlife species' needs, soil productivity, and current conditions. Locally developed standards shall also specify how downed wood is to be treated under various management actions (for example, harvest, thinning, salvage, and prescribed fire). In the absence of this analysis, the following shall be provided (applies to lands where forest management activities occur). In areas where these numbers are not attainable, provide amounts as close as possible to those listed, substitute other species where possible to meet numbers listed and document why conditions cannot be met. See PE-S1, S3.

Dry Forest	
Ponderosa pine	6 logs / acre > 10" average diameter, 25+% of these >20" ave. diameter
Moist Forest	
Mixed conifer	33 logs / acre > 15"average diameter with an average length of 35 feet. Of these, 40% should be > 20".
Cold Forest	
Lodgepole pine	20 logs / acre > 10"average diameter with an average length of 30 feet. Largest logs available should be left.

In addition to the above, hollow logs have particular importance for native plants and animals and should be well distributed across habitats where they occur.

Alternative 4

Alternative 5

HA-S8. Standard: ***Inside timber and livestock priority areas:*** Develop downed wood standards appropriate for local conditions and management priority.

Outside timber and livestock priority areas: Same as Alternative 3.

Alternative 6

HA-S8. Standard: Same as Alternative 3.

Alternative 7

HA-S8. Standard: Same as Alternative 3.

HA-S8. Rationale: *Coarse woody debris is not only important to a wide variety of wildlife species, it is essential for soil productivity, and supplies food and habitat to a large number of invertebrates and microorganisms including mychorrizae. It influences the carbon cycle, hydrologic cycle, fire cycle, nutrient cycle, food web, and other important processes. Coarse woody debris will not be evenly distributed in size or amount across the landscape or across the project area. It will vary with topographical features, climate, slope, aspect, habitat type, successional stage, management practices and many other factors. To reduce redundancy and oversimplification of standards, HA-S8 will be integrated with PE-S1 before the final EIS is released.*

HA-S9. Standard: Varies. See: A1/TE-S14 A1/TE-S15	**HA-S9. Standard:** Same as Alternative 1.	**HA-S9. Standard:** Firewood programs shall be managed to be consistent with snag and downed wood standards (HA-S7, HA-S8, PE-S1, PE-S3, and PE-S2). This standard shall also be consistent with AQ-O1.			
HA-S10. Standard: Varies. See: A1/TE-S10 A1/TE-G8	**HA-S10. Standard:** Same as Alternative 1.	**HA-S10. Standard:** Restore frequency of distribution and ecological integrity of native stands of mountain mahogany, bitterbrush, and quaking aspen. Also applies to TS-O2 and TS-O6.	**HA-S10. Standard:** ***Inside wildlife priority areas:*** Same as Alternative 3. ***Outside wildlife priority areas:*** Not applicable.	**HA-S10. Standard:** Same as Alternative 3.	**HA-S10. Standard:** ***Inside reserves:*** Not applicable. See TS-O6 for direction. ***Outside reserves:*** Same as Alternative 3.
		Rationale: *Improper livestock grazing and changes in fire cycles are only two of the known causes in changes in frequency, productivity, and vigor in these plant species. A wide variety of wildlife species are dependent on these native stands for food and cover.*			
HA-S11. Standard: Varies. See: A1/TE-G8 A1/TE-G9 A1/TE-G11 A1/TE-S16 A1/TE-S17	**HA-S11. Standard:** Same as Alternative 1.	**HA-S11. Standard:** Restore native plant community composition, vigor, productivity and ecological integrity of important wild ungulate winter ranges. Applies also to TS-O2 and TS-O6.	**HA-S11. Standard:** ***Inside wildlife priority areas:*** Same as Alternative 3. ***Outside wildlife priority areas:*** Not applicable.	**HA-S11. Standard:** Same as Alternative 3.	**HA-S11. Standard:** ***Inside reserves:*** Not applicable. See TS-O6 for direction. ***Outside reserves:*** Same as Alternative 3.
		Rationale: *Native plant abundance, frequency of occurrence, and vigor in deer and elk winter ranges have had dramatic changes since historical times. Winter ranges are typically in lower elevation areas which are normally dominated by the dry shrub potential vegetation group. The remaining dry shrubland areas are in need of restoration if they are to provide habitat for wintering wildlife.*			
HA-S12. Standard: Varies. See: A1/TE-S18	**HA-S12. Standard:** Same as Alternative 1.	**HA-S12. Standard:** Bat roost sites and hibernacula in occupied caves, cliffs, and old mines shall be protected.			

TERRESTRIAL AND AQUATIC SPECIES AND HABITATS

ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7

Protection/Restoration of Listed Species Habitats

Alternative 1	Alternative 2	Alternatives 3–7
HA-O3. Objective: Varies. See: A1/TE-O6 A1/AQ-O2	**HA-O3. Objective:** Same as Alternative 1 plus: A2/AQ-O1 A2/AQ-O2 A2/AQ-O3	**HA-O3. Objective:** Restore or protect habitat for listed species. Manage habitat to prevent listing of species. (See also HA-O2.) ***Rationale:*** *The Forest Service and Bureau of Land Management have legal responsibilities and policy requirements to provide habitat for threatened, endangered, proposed, candidate, and sensitive species, and species of special interest to the tribes. Meeting these responsibilities requires restoration of degraded habitat and maintenance of high quality habitat necessary for the recovery of these species. It is BLM and Forest Service policy to manage habitat to prevent the listing of candidate and sensitive or special status species.*

HA-S13. Standard: Habitats shall be managed to recover special status species and prevent the listing of these species as candidate, threatened, or endangered.

Rationale: *BLM Manual 6840 and Forest Service Manual 2600.*

Alternative 1	Alternative 2	Alternatives 3–7
HA-O4. Objective: Varies. See: A1/TE-O5 A1/TE-O6	**HA-O4. Objective:** Same as Alternative 1 plus: A2/AQ-O4	**HA-O4. Objective:** Manage rangelands to provide for habitat requirements (including breeding, feeding, protection, dispersal, and travel) of threatened, endangered, proposed, candidate, and sensitive species closely associated with or dependent on native rangeland upland and riparian areas. ***Rationale:*** *Species closely tied to native bunch grass, native shrub/steppe, and native forb communities are declining due to fragmentation and a decline in the occurrence of native rangeland communities. These species' habitat needs include breeding, feeding, protection, dispersal and travel. Of special importance is protection during nesting and rearing of young. (Note: Further refinement of rangeland vegetation and terrestrial species needs will likely occur prior to releasing the Final EIS.)*

HA-O5. Objective: Varies. See: A1/TE-O5 A1/TE-O6	**HA-O5. Objective:** Same as Alternative 1 plus: A2/AQ-O4	**HA-O5. Objective:** Provide for the continued existence and / or long-term conservation of species, species assemblages, and unique ecosystems found in the Upper Klamath Basin, Owyhee Uplands, and Northern Great Basin. ***Rationale**: National Forest Management Act, viability, biodiversity.*

Recovery of Federally Listed Terrestrial and Aquatic Species

HA-O6. Objective: Contribute to the recovery of federally listed or proposed species (or subspecies or populations) across their range by restoring and maintaining and habitat quality, quantity, and effectiveness. (See also HA-O3 and HA-O2.)

***Rationale**: Section 7 of the 1973 Endangered Species Act, as amended, requires the Forest Service and BLM to manage consistent with and in consultation with listing agencies. Range-wide recovery requires a higher level of management (for example collaboration and cooperation among federal, tribal, state, and local agencies) than strictly being in compliance with recovery plans. The Forest Service and BLM recognize special status species and have management strategies in place to prevent further listing.*

HA-S14. Standard: Both: Varies. See: A1/TE-S19	**HA-S14. Standard:** Same as Alternative 1 plus: A2/AQ-S11	**HA-S14. Standard:** Implement recovery plans where recovery tasks apply to lands managed by the Forest Service and BLM. Departure from approved recovery plans and conservation strategies shall be documented in appropriate NEPA analysis and decision notices and records of decision. Develop annual reports on progress and achievements.
HA-S15. Standard: In the context of Standard HA-S14 for raptor species, subspecies, and populations that are significantly recovering within the project area, apply standards and guidelines from finalized agency documents that have been contributing to recovery.		**HA-S15. Standard:** In the context of Standard HA-S14 for raptor species, subspecies, and populations that are significantly recovering within the project area, apply standards and guidelines from finalized agency documents that have been contributing to recovery, and incorporate new scientific information into adaptive management strategies.

***Rationale**: The bald eagle and peregrine falcon are near recovery goals identified in recovery plans. Agencies should continue efforts that have been contributing to recovery until species are delisted.*

HA-S16. Standard: Management activities shall be consistent with uniform planning and management procedures by adopting the resource management guidelines and grizzly bear management situations as established in the Interagency Grizzly Bear Management (IGBC) Guidelines (1986), or its successor.

***Rationale**: Guidelines need to be uniformly applied for consistency of anticipated effects.*

Terrestrial and Aquatic Species and Habitats

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7

HA-S17. Standard: Management activities shall be consistent with access management recommendations developed by the Interagency Grizzly Bear Committee Managers Subcommittee for the Cabinet / Yaak and Selkirk Mountains Grizzly Bear Recovery Zones, following NEPA procedures at appropriate scales.

***Rationale**: Access provided by roads increases the vulnerability of grizzly bears to mortality. Proposals for development and use of roads need to be evaluated in the context of the effect on vulnerability of bears to mortality.*

Alternative 1	Alternative 2	Alternatives 3–6	Alternative 7
HA-S18. Standard: Varies. See: A1/TE-S19	**HA-S18. Standard:** Same as Alternative 1.	**HA-S18. Standard:** In any recovery area where road densities are higher than thresholds in the IGBC task force report, NEPA analysis for additional proposed land-modifying activities should include complete habitat mapping and cumulative effects analysis. ***Rationale**: There is a need to understand the relationship of how habitat modification in roaded areas affects the suitability of the range wide habitat.*	**HA-S18. Standard:** ***Inside reserves:*** Not applicable. ***Outside reserves:*** Same as Alternative 3.
HA-S19. Standard: Varies. See: A1/TE-S19	**HA-S19. Standard:** Same as Alternative 1.	**HA-S19. Standard:** NEPA analysis for proposed land-disturbing activities in the Selkirk and Cabinet / Yaak Grizzly Bear ecosystems should evaluate the IGBC strategy for reducing grizzly bear mortalities. ***Rationale**: Proposed actions need to be consistent with established and agreed-upon strategies, such as the IGBC strategies, unless local information warrants departure from such strategies, and departures are approved by the IGB Committee.*	**HA-S19.** Standard: ***Inside reserves:*** Not applicable. ***Outside reserves:*** Same as Alternative 3.

Wildlife and Livestock Conflicts

Alternative 1	Alternative 2	Alternatives 3–6	Alternative 7
HA-O7. Objective: Varies. See: A1/TE-O6	**HA-O7. Objective:** Same as Alternative 1.	**HA-O7. Objective:** Implement management practices that reduce the potential conflicts of livestock (domestic sheep, cattle, and horses) with carnivores and domestic sheep with wild sheep. ***Rationale**: There is a high level of potential conflict between livestock and large forest carnivores and between domestic sheep and wild sheep. Encounters can result in conflicts that have negative consequences for both wildlife and livestock.*	**HA-O7. Objective:** ***Inside reserves:*** Not applicable. ***Outside reserves:*** Same as Alternative 3.

Alternative 1	Alternative 2	Alternatives 3–4	Alternative 5	Alternative 6	Alternative 7
HA-S20. Standard: Varies. See: A1/TE-S16 A1/TE-S17	**HA-S20. Standard:** Same as Alternative 1.	**HA-S20. Standard:** Minimize conflicts between carnivores and livestock management practices.	**HA-S20. Standard:** ***Inside livestock priority areas:*** Same as Alternative 3. ***Outside livestock priority areas:*** Not applicable.	**HA-S20. Standard:** Same as Alternative 3.	**HA-S20. Standard:** ***Inside reserves***: Not applicable. ***Outside reserves:*** Same as Alternative 3.

***Rationale**: Livestock management practices on public land, including calving or lambing, can create situations where carnivores come in conflict with livestock and their owners.*

HA-S21. Standard: Varies. See: A1/TE-S16 A1/TE-S17	**HA-S21. Standard:** Same as Alternative 1.	**HA-S21. Standard:** Reduce the potential for disease transmission between domestic sheep and bighorn sheep.	**HA-S21. Standard:** ***Inside livestock priority areas:***Work collaboratively with livestock operators to develop methods to minimize disease transmission between domestic and big-horn sheep. ***Outside livestock priority areas:*** Same as Alternative 3.	**HA-S21. Standard:** Same as Alternative 3.	**HA-S21. Standard:** ***Inside reserves:*** Not applicable. ***Outside reserves:*** Same as Alternative 3.
		***Rationale**: Numerous research studies and monitoring of actual bighorn "die-offs" has indicated a high correlation between die-offs and contact between domestic sheep and bighorn sheep in the transmission of diseases fatal to bighorn sheep.*			

Human Uses and Values

Collaboration

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
HU-O1. Objective: Varies. See: A1/HU-O3 A1/HU-O4 A1/HU-O2	**HU-O1. Objective:** Same as Alternative 1.	**HU-O1. Objective:** Foster support of decisions by promoting collaboration through increased levels and types of involvement opportunities for a broad range of stakeholders. ***Rationale:*** *Social scientists, federal agencies, and members of the public agree that ecosystem management requires new approaches to public participation. Collaborative efforts that build bridges among scientists and public land stakeholders result in public land management that is better understood, more widely accepted, and more implementable. Many people have described the lack of institutional arrangements for fully discussing and reaching consensus on public land issues as a major barrier to ecosystem management. The intent of this objective is to create a better interaction between federal agencies and the public, creating a forum where science, local knowledge, and other information can be described, understood by everyone involved, and translated into implementable management action.*				
HU-O2. Objective: Varies. See: A1/HU-O3 A1/HU-O7	**HU-O2. Objective:** Same as Alternative 1.	**HU-O2. Objective:** Foster support of decisions by promoting collaboration through increased intergovernmental coordination with federal, state, county, and tribal governments, and Resource Advisory Councils in planning, implementation, and monitoring efforts.				
HU-S1. Standard: Not Applicable.	**HU-S1. Standard:** Not Applicable.	**HU-S1. Standard:** Within two years, each National Forest and BLM District shall initiate a memorandum of understanding or equivalent document with appropriate state, county, and tribal elected officials to offer advice and recommendations to federal land managers in decision-making. Applies also to Objective HU-O6.				

Economic Activity

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
HU-O3. Objective: Varies. See: A1/HU-O5	**HU-O3. Objective:** Same as Alternative 1.	**HU-O3. Objective:** Derive social and economic benefits, promote commercial activity, and foster demand for labor and capital formation through producing a mix of goods and services. ***Rationale:*** *Goods and services, both market (priced) and non-market (not priced), can be used to generate economic activity and fulfill other social and cultural needs. It is a widely held social goal that the type, amount, and distribution of goods and services should provide society the most benefits at the least cost. This describes a social preference for economic efficiency.*				
HU-O4. Objective: Varies. See: A1/HU-O5	**HU-O4. Objective:** Same as Alternative 1.	**HU-O4. Objective:** Provide the most benefits to society with funds expended by efficiently delivering goods and services.				

HU-O5. Objective: Varies. See: A1/HU-O5	**HU-O5. Objective:** Same as Alternative 1.	**HU-O5. Objective:** Minimize large annual shifts in commercial activity that cause rapid changes in demand for labor (gain or loss) and capital, including the offering of timber and forage.			
HU-O6. Objective: Varies. See: A1/HU-O5	**HU-O6. Objective:** Same as Alternative 1.	**HU-O6. Objective:** Emphasize customary economic uses in rural communities or geographic areas that are less economically diverse and more dependent on outputs of goods and services from Forest Service- and BLM-administered lands. These places, referred to in this EIS as "Areas of Economic Vulnerability" would be areas (1) where these uses generate a substantial percent of local employment; (2) that are geographically isolated; (3) that are not gaining substantial employment opportunities in other industries; and would include, as a minimum, those areas identified as "isolated timber-dependent communities" in the Economics (Haynes and Horne 1996) chapter of the *Assessment of Ecosystem Components*. (See Chapter 2 in this EIS for more discussion.)	**HU-O6. Objective:** Not applicable.	**HU-O6. Objective:** Same as Alternative 3.	**HU-O6. Objective:** ***Inside reserves:*** Not applicable. ***Outside reserves:*** Same as Alternative 3.
		***Rationale**: The intent of this objective is to help sustain an area through the transition to a less dependent condition. The intent is not to maintain Areas of Economic Vulnerability in a priority status or to necessarily favor specific industries. The objective stems from the recognition that few economic options are available in these areas, that BLM and Forest Service actions have a reasonable chance to contribute to community vitality, and that the continued existence and vitality of these areas is in the public interest.*			
HU-O7. Objective: Varies. See: A1/HU-O5	**HU-O7. Objective:** Same as Alternative 1.	**HU-O7. Objective:** Contribute to economic diversity consistent with local economic development goals. Economic diversity is recognized as a factor important to community resiliency.			
HU-O8. Objective: Varies. See: A1/HU-O3 A1/HU-O4 A1/HU-O7	**HU-O8. Objective:** Same as Alternative 1.	**HU-O8. Objective:** Foster compatibility of land uses and management strategies to local economic development goals through collaboration with local entities. ***Rationale:** Many communities have already begun the process of collectively identifying their strengths, weaknesses, visions of what they want to be in the future, and challenges they expect to face -- essentially a strategic planning process. Ecosystem management provides an avenue for federal agencies to assist with these ongoing processes, upon request by interested communities and based on local interests and needs. The emphasis is on collaboration rather than providing direction, so there is no prescriptive design for the form or extent of this assistance.*			
HU-O9. Objective: Varies. See: A1/HU-O3 A1/TE-O1	**HU-O9. Objective:** Same as Alternative 1.	**HU-O9. Objective:** Reduce life and property loss due to wildfire and decrease future wildfire suppression costs by actively managing fuels and fire risk on areas of Forest Service- and BLM-administered lands within or adjacent to wildland-urban interface areas. Protection of life and property shall be a high priority in these areas. See Standard HU-S2. ***Rationale:** Fire suppression within the urban interface zone has become increasingly costly both in monetary terms and risk to human life. As fire intensity and frequency have increased, the amount of protection required on the interface boundary has increased. Structural protection equipment is more costly than forest and rangeland firefighting equipment. Firefighting personnel are placed in positions of higher risk, to hold lines that for other wildfires might be moved to a more strategic position. Values at risk are higher, and occur on ownerships adjacent to the forest and range boundaries. There is high public interest in protection of homes and possessions.*			

HUMAN USES AND VALUES

ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7
HU-S2. Standard: Varies. See: A1/HU-G2 A1/TE-S2	**HU-S2. Standard:** Same as Alternative 1.	**HU-S2. Standard:** Involve local governments plus other landowners' organizations as appropriate to develop coordinated fuel management plans.				

Recreation Opportunities

ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7
HU-O10. Objective: Supply recreation opportunities for the public consistent with public policies and the ability of BLM- and Forest Service-administered lands to provide those opportunities.		**HU-O10. Objective:** Same as Alternatives 1 and 2 plus identify emerging recreation opportunities that result from restoration strategies and changing land uses.		**HU-O10. Objective:** ***Inside recreation priority areas:*** Invest in the development, maintenance, and operation of recreation assets and services most used by the public. ***Outside recreation priority areas:*** Same as Alternative 3.	**HU-O10. Objective:** Same as Alternative 3.	**HU-O10. Objective:** Same as Alternative 3.
HU-S3. Standard: The recreation opportunity spectrum (ROS) or other appropriate agency direction shall be used to guide inventory and management to meet goals for recreation settings and experiences.						
HU-O11. Objective: See: A1/HU-O1, A1/HU-O10.		**HU-O11. Objective:** Identify opportunities to provide public access for recreation purposes consistent with maintaining or achieving desired terrestrial, aquatic, and riparian conditions.		**HU-O11. Objective:** ***Inside recreation priority areas:*** Provide public access for recreation consistent with RM-O2, RM-S1, RM-S8, RM-S9, RM-O4, and RM-S15. ***Outside recreation priority areas:*** Same as Alternative 3.	**HU-O11. Objective:** Same as Alternative 3.	**HU-O11. Objective:** Same as Alternative 3.

HU-O12. Objective: Varies. See: A1/HU-O3 A1/HU-O4 A1/HU-O5	**HU-O12. Objective:** Same as Alternative 1. plus: A2/AQ-S2	**HU-O12. Objective:** Foster and strengthen partnerships between public and private sectors to effectively and efficiently manage recreation and tourism facilities and services.
HU-O13. Objective: Varies. See: A1-HU-O2	**HU-O13. Objective:** Same as Alternative 1.	**HU-O13. Objective:** Meet established visual quality objectives based on management principles and techniques from the applicable agency visual landscape management system.
HU-O14. Objective: Varies. See: A1/HU-O2	**HU-O14. Objective:** Same as Alternative 1.	**HU-O14. Objective:** Maintain or enhance scenic integrity through management of forest and rangeland vegetation and road densities.

Cultural Resources

HU-S4. Standard: Varies. See: A1/HU-S3	**HU-S4. Standard:** Same as Alternative 1.	**HU-S4. Standard:** A strategy shall be developed to survey and evaluate the significance of Forest Service- and BLM-administered lands for cultural resources. (See TI-O1.) ***Rationale:*** *Current heritage program strategies, which identify and evaluate cultural resources, typically focus efforts on individual sites. Such strategies often miss the bull breadth of cultural resource information (such as ethnography, oral/written history, ethno-habitats, and natural and heritage resource distribution patterns), which may help reveal a traditional cultural property. Program strategies should prescribe watershed-scale cultural resource surveys and assessments that are accomplished prior to signing decisions on activities, so a more complete recognition of integrated cultural resource patterns can be considered.*
HU-S5. Standard: Varies. See: A1/HU-S3	**HU-S5. Standard:** Same as Alternative 1.	**HU-S5. Standard:** Sites and areas shall be evaluated and nominated as appropriate to the National Register of Historic Places. ***Rationale:*** *Archeological Resource Protection Act (ARPA), Native American Graves Protection and Repatriation Act (NAGPRA), National Historic Preservation Act (NHPA), and executive orders to protect tribal sacred sites not only recognize federal trust responsibilities, but also serve to meet that obligation. See Bulletin 38 issued by the Department of the Interior.*
HU-S6. Standard: Varies. See: A1/HU-S3 A1/HU-O7	**HU-S6. Standard:** Same as Alternative 1.	**HU-S6. Standard:** Site-specific projects shall be assessed for potential effects on cultural resources. Assessments shall address traditional cultural properties and plant species considered sensitive by tribes. Consultation shall take place with affected tribes to address tribal interests, evaluate those interests, account for those interests in a decision, and implement the decisions. Mutually acceptable procedures between tribes and agencies should be employed. The ability for the project to proceed shall be directly tied to the ability to adequately survey the site, consult on Tribal interests, and accomplish a necessary mitigation. (See also HU-S4 and HU-S5.)

Transportation and Utility Cooridors

HU-O15. Objective: Varies. See: A1/HU-O10	**HU-O15. Objective:** Same as Alternative 1.	**HU-O15. Objective:** Ensure that reliable and buildable utility corridors are available to serve existing and future regional and local energy, communication, and transportation needs.

HUMAN USES AND VALUES

ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7
HU-S7. Standard: Not Applicable.	**HU-S7. Standard:** Not Applicable.	**HU-S7. Standard:** Use the 1993 Western Regional Utility Corridor Study, or its successors, as a reference document when considering land use decisions that may affect existing and/or proposed major utility corridors.				
HU-O16. Objective: Varies. See: A1/HU-O10	**HU-O16. Objective:** Same as Alternative 1.	**HU-O16. Objective:** Ensure that access essential for corridor infrastructure repairs and maintenance is available.				
HU-S8. Standard: Varies. See: A1/HU-S15	**HU-S8. Standard:** Same as Alternative 1.	**HU-S8. Standard:** Continue to provide access to and maintenance of existing utility rights-of-way for infrastructure repairs and vegetation maintenance activities in accordance with special use permits, land use grant instruments, and easement agreements.				
HU-O17. Objective: Not Applicable.	**HU-O17. Objective:** A2/AQ-S24	**HU-O17. Objective:** Encourage integrated right-of-way vegetation management which minimizes impacts and maintenance needs while enhancing ecosystem values.				

Federal Trust Responsibility and Tribal Rights and Interests

Alternative 1	Alternative 2	Alternatives 3, 4, 5, 6, 7
Government-To-Government Cooperation and Relations		
TI-O1. Objective: Varies. See: A1/HU-O7	**TI-O1. Objective:** Same as Alternative 1.	**TI-O1. Objective:** Maintain a government-to-government relationship with affected federally recognized tribes. Develop meaningful relationships to understand and incorporate tribal cultural resources, needs, interests, and expectations in federal land management, and allow cooperative activities where there are shared goals. ***Rationale:*** *Federal law requires the BLM and Forest Service to consider tribal interests when conducting actions that may affect natural resources on or off tribal lands, and / or the socioeconomic well-being of its people. See the section on Current Federal Agency Relations in Chapter 2.*
TI-S1. Standard: Varies. See: A1/HU-O7	**TI-S1. Standard:** Same as Alternative 1.	**TI-S1. Standard:** Agencies shall employ a consistent approach to government-to-government consultation that includes effective Tribal participation in decision-making and assures rights are protected. Agencies and Tribes shall develop a mutually acceptable protocol for consultation, which includes provisions for a dispute resolution process in cases of conflicts between agency and Tribal positions.
TI-S2. Standard: Varies. See: A1/HU-O7	**TI-S2. Standard:** Same as Alternative 1.	**TI-S2. Standard:** Agreements shall be developed with tribal governments specifying repatriation procedures in conformance with Native American Graves Protection and Repatriation Act (NAGPRA) and consultation procedures regarding federal compliance with NAGPRA, National Historic Preservation Act, and Archaeological Resource Protection Act.
TI-S3. Standard: Varies. See: A1/HU-O7	**TI-S3. Standard:** Same as Alternative 1.	**TI-S3. Standard:** Where Tribes regulate hunting, fishing, gathering and grazing activities of Tribal members, USFS / BLM shall recognize Tribal management efforts and work cooperatively with Tribes and states. ***Rationale:*** *Tribes with Treaties that retained rights to access for hunting, fishing, gathering, and livestock grazing regulate tribal use of those resources. These tribes recognize the need to regulate use when the resources present cannot meet all their needs. These tribes regulate the use by tribal members on the reservations and off the reservations on ceeded lands. This standard is provided to assure that these tribal programs are recognized and incorporated as the Forest Service and BLM develop planning decisions.*
TI-S4 Standard: Varies. See: A1/HU-O7 A1/TE-S19	**TI-S4 Standard:** Same as Alternative 1.	**TI-S4 Standard:** Federal land managers shall cooperate with Tribal efforts regarding research and restoration of treaty / trust resources (for example, re-establishment of salmon in Columbia River tributaries, mule deer in the Klamath Basin, and antelope in eastern Idaho).
TI-O2. Objective: Varies. See: A1/HU-O6	**TI-O2. Objective:** Same as Alternative 1.	**TI-O2. Objective:** Assess sense of place to better understand and incorporate into federal land management how places on the landscape are valued by American Indians. (See Chapter 2 discussion of Sense of Place.) ***Rationale:*** *There are general place attachment distinctions recognized by traditional American Indian communities / tribes and the American public. These differences in place attachments are in part based on: (1) the greater length of time native cultures have spent in the project area; (2) the greater degree place attachments have been integrated into their culture systems of religion, economy, politics, and social / kinship; and (3) cultural values, histories, and relationships to landscapes, which vary from mainstem American culture and are typically not understood by the public. Therefore, there is a need to develop separate sections in place assessments for American Indian groups and the public. Also, most Indian tribes and communities consider cultural place information inappropriate for public dissemination, making it difficult to conduct and document a single place assessment. However, there will likely be place attachments discovered that represent common place meaning shared by Indian communities and the general public.*

Federal Trust Responsibility and Tribal Rights and Interests

Alternative 1	Alternative 2	Alternatives 3, 4, 5, 6, 7
TI-S5. Standard: Not Applicable.	**TI-S5. Standard:** Not Applicable.	**TI-S5. Standard:** Agencies should complete an assessment of identified places of value to American Indians as a part of ecosystem analysis and within the consultation process with affected tribes and American Indian communities. See Objectives EM-O3, HU-O2, and Standard A-S1. ***Rationale:*** *This standard uses "should" primarily to allow for the possibility that tribes will prefer to participate at different levels.*

Habitat Conditions

Alternative 1	Alternative 2	Alternatives 3, 4, 5, 6, 7
TI-O3. Objective: Varies. See: A1/HU-O6	**TI-O3. Objective:** Same as Alternative 1.	**TI-O3. Objective:** Recognize native plant communities as traditional resources that are important to Tribes and as an essential component to treaty-reserved gathering rights.
TI-S6. Standard: Not Applicable.	**TI-S6. Standard:** Not Applicable.	**TI-S6. Standard:** Programs for restoration and maintenance of native plant communities for Tribes' gathering activities shall be established in cooperation with tribes.
TI-S7. Standard: Varies. See: A1/TE-S19 A1-AQ-S1	**TI-S7. Standard:** Same as Alternative 1.	**TI-S7. Standard:** The Forest Service and BLM shall provide fish and wildlife habitat conditions capable of supporting harvestable resources. (Also applies to HA-O2.)
TI-S8. Standard: Varies. See: A1/HU-O6	**TI-S8. Standard:** Same as Alternative 1.	**TI-S8. Standard:** Land allocations in each Tribe's ceded lands shall be specifically considered for protection and restoration of treaty resources.
TI-S9. Standard: Not Applicable.	**TI-S9. Standard:** Not Applicable.	**TI-S9. Standard:** Habitat conditions shall be assessed where a habitat has an identified social and / or traditional importance to an affected tribe or American Indian community, such as places for hunting, fishing, gathering, and grazing. This assessment shall occur prior to implementation of activities.
TI-S10. Standard: Varies.	**TI-S10. Standard:** Same as Alternative 1.	**TI-S10. Standard:** An aquatic conservation strategy that meets Endangered Species Act, Clean Water Act, and trust responsibility obligations shall be adopted.
TI-S11. Standard: Not Applicable.	**TI-S11. Standard:** Not Applicable.	**TI-S11. Standard:** Where it becomes necessary to implement Conservation Measures in the Endangered Species Act, restrictions on Tribal activities shall be the least restrictive possible, and implemented only when restrictions on non-Indian activities are insufficient to ensure Conservation.

Road Management

Alternative 1	Alternative 2	Alternatives 3, 4, 5, 6, 7
RM-O1. Objective: Varies. See: A1/HU-O3 A1/HU-O4	**RM-O1. Objective:** Same as Alternative 1 plus: A2/AQ-S2	**RM-O1. Objective:** Cooperate with federal, tribal, state, and county agencies, and other cost-share partners, to achieve consistency in road design, operation, and maintenance necessary to attain ICBEMP objectives.

Road-Related Adverse Effects

Alternative 1	Alternative 2	Alternatives 3, 4, 5, 6, 7
RM-O2. Objective: Varies. See: A1/HU-O10 A1/HU-O1 A1/HU-O6 A1/AQ-O2 A1/TE-O6 A1/TE-O1 A1/PE-O1 A1/AQ-O5	**RM-O2. Objective:** Same as Alternative 1 plus: A1/AQ-O4	**RM-O2. Objective:** Progressively reduce road-related adverse effects and potential effects on watershed integrity, soil productivity, and aquatic/riparian and terrestrial species and their habitat. This includes reducing direct and indirect mortality of species and decreasing avoidance behavior of terrestrial species. Provide for resource management activities and human access needs, such as tribal and recreation activities. Make decisions on individual roads at the local level, based on appropriate analysis and collaboration. ***Rationale:*** *Road access is needed for resource management, meeting tribal needs, and public use. There are also legal rights of property owners with lands surrounded by federal lands, of tribes, and others to have road access to and through agency-administered lands. However, the* Scientific Assessment *(Quigley and Arbelbide 1996) identified roads as a major impact on a multitude of physical and biological processes. Roadways are prone to erosion and can cause increased sedimentation adversely affecting hydrologic or sediment regimes and aquatic habitat. Road access increases human wildlife conflicts and roads fragment terrestrial habitat. Permanent road closures would apply primarily, but not exclusively, to native surface roads. Also applies to PE-O3.*
RM-S1. Standard: Varies. See: A1/AQ-S1 A1/AQ-S3	**RM-S1. Standard:** Same as Alternative 1 plus: A2/AQ-S2 A2/AQ-S3 A2/AQ-S4 A2/AQ-S5	**RM-S1. Standard:** Road-related adverse effects shall be progressively reduced to achieve aquatic, terrestrial habitat, and other relevant objectives. At the scale in which Ecosystem Analysis at the watershed scale is conducted (5th- or 6th-field HUC), quality and quantity road indicators and road-related use shall be used to assess adverse effects on aquatic/riparian and terrestrial species and their habitat. The primary indicators for road *quality* are road condition, surface type, and location. The primary indicators for road-related use are amount, type, and season of use. The primary indicator for road *quantity* is federal roadway miles per square mile measured at the sub-basin scale and reported at the BLM District/National Forest level. Reduction of road-related adverse effects shall be accomplished by, but are not limited, to the following: obliteration; permanent closures; seasonal closure; and road improvements (upgrade culverts, grade, surfacing). ***Rationale:*** *The intent of this standard is that restoration activities will be prioritized based on risks and budgets; therefore, the most significant effects can be reduced first. The intent is not that all road-related effects should be reduced, realizing there are benefits and trade-offs associated with roads.*

Road Management

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
RM-S2. Standard: Not Applicable.	**RM-S2. Standard:** Not Applicable.	**RM-S2. Standard:** Not applicable.	**RM-S2. Standard:** Not applicable.	**RM-S2. Standard: Inside timber and livestock priority areas:** Management actions (such as livestock grazing, ground-disturbing activities, road building or maintenance) shall not increase the incidence of bank erosion, mass movements, or sediment introduction into stream systems. ***Outside timber and livestock priority areas:*** Not applicable.	**RM-S2. Standard:** Not applicable.	**RM-S2. Standard:** Not applicable.
RM-S3. Standard: Not Applicable.	**RM-S3. Standard:** A2/AQ-S3	**RM-S3. Standard:** National Forests and BLM Districts shall conduct a systematic Road Condition/Risk Assessment across the project area using standardized processes at appropriate scales. This assessment shall be a component of sub-basin review, Ecosystem Analysis at the Watershed Scale, development and revision of access and travel management plans, and/or project design, as appropriate. ***Rationale:*** *A detailed field-level road inventory would not be necessary for sub-basin review or Ecosystem Analysis at the Watershed Scale. Broad-scale road information and sub-basin characteristics would be needed during sub-basin review to validate data in the* Assessment of Ecosystem Components *(Quigley et al. 1996b) and to prioritize further analyses. Sub-basin or finer resolution information would be needed during Ecosystem Analysis at the Watershed Scale to characterize existing conditions and identify site-specific opportunties at this scale.*				

RM-S4. Standard: Not Applicable.	**RM-S4. Standard:** A2/AQ-S4	**RM-S4. Standard:** National Forests and BLM Districts shall develop or revise Access and Travel Management plans or other transportation plans, to address risks identified in the Road Condition/Risk Inventory (RM-S3) to achieve ICBEMP goals and objectives. Where completed, the results of sub-basin review and Ecosystem Analysis at the watershed scale shall be used in the development, review, and revision of access and travel management plans or other transportation plans. These plans shall identify long-term transportation needs and road maintenance practices. These plans shall also be used to identify and prioritize roads for rehabilitation, closure, or obliteration to reduce road-related effects to watershed integrity, soil productivity, and aquatic/riparian and terrestrial species and their habitats. The plans shall address the following items: - road design criteria, elements, and standards that govern construction and reconstruction; - road management objectives for each road; - criteria that govern road operation, maintenance, and management; - requirements for pre-, during-, and post-storm inspections and maintenance; - regulation of traffic during wet periods to minimize erosion and sediment delivery and accomplish other objectives; - implementation and effectiveness of monitoring plans for road stability, drainage, and erosion control; - mitigation plans for road failures; and - road-related effects to terrestrial species and their habitats including amount, type, and season of use.	**RM-S4. Standard:** Same as Alternative 3; plus road design, plans, and density shall be modified to efficiently carry out applicable uses in priority areas (shown on Maps 3-14 and 3-15), consistent with RM-O2, RM-S1, RM-S8, RM-S9, RM-O4, and RM-S15.	**RM-S4. Standard:** Same as Alternative 3.	**RM-S4. Standard:** Same as Alternative 3.

Rationale: *The intent of this standard is that decisions on management of roads should be made at the local level with involvement from interested and affected parties through the local access and travel management plan processes. Overall direction from this DEIS sets the course for reducing adverse effects. Decisions on how to accomplish this will be made at the local level.*

Road Management

Alternative 1	Alternative 2	Alternatives 3, 4, 5, 6, 7
RM-S5. Standard: Not Applicable.	**RM-S5. Standard:** A2/AQ-S3 A2/AQ-S4	**RM-S5. Standard:** The influence of roads on aquatic and terrestrial objectives shall be determined during Ecosystem Analysis at the watershed scale and Road/Risk Inventories (RM-S3). Adverse effects on aquatic/riparian and terrestrial species and their habitats shall be reduced by: - Reconstructing road and drainage features that do not meet design criteria or operation and maintenance standards, have been shown to be less effective for controlling sediment delivery, slow down attainment of Riparian Management Objectives, or do not protect watersheds from increased sedimentation and peak flows. - Prioritizing reconstruction based on current and potential damage to aquatic resources and their watersheds, ecological value of the riparian resources affected, and feasibility of options such as helicopter logging and road relocation out of Riparian Conservation Areas. - Closing and stabilizing or obliterating and stabilizing roads not needed for future management activities. These actions shall be prioritized based on current and potential damage to aquatic resources in watersheds and ecological value of the riparian resources affected.
RM-S6. Standard: Varies. See: A1/TE-S19	**RM-S6. Standard:** Same as Alternative 1 plus: A2/AQ-S3 A2/AQ-S4	**RM-S6. Standard:** Determine habitat effectiveness ratings necessary to reduce the risk of displacement and mortality of species caused by human access. Emphasis shall be in areas with large forest carnivores/omnivores. Use effectiveness rating in determining road management decisions including locations and timing of seasonal and permanent closures. ***Rationale**: One of the major causes of mortality of forest carnivores and omnivores is related directly to human access. Stresses caused by access to wintering areas has also been demonstrated to cause problems for a number of species.*
RM-S7. Standard: Varies. See: A1/AQ-S1 A1/AQ-S2 A1/AQ-S3	**RM-S7. Standard:** Same as Alternative 1 plus: A2/AQ-S5	**RM-S7. Standard:** Design new and improve existing culverts, bridges, and other stream crossings to accommodate a 100-year flood, including associated bedload and debris where those existing structures pose a substantial risk to riparian conditions. "Substantial risk" is defined as those that do not meet design and operation maintenance criteria, or that have been shown to be less effective for controlling erosion, or that retard attainment of RMOs. Base priority for upgrading on risks and the ecological value of the riparian resources affected. Construct and maintain crossings to prevent diversion of streamflow out of the channel.

Road Density

Alternative 1	Alternative 2	Alternatives 3, 4, 5, 6, 7
RM-O3. Objective: Varies. See: A1/TE-O6 A1/AQ-O1 A1/AQ-O2 A1/AQ-O5 A1/PE-O5	**RM-O3. Objective:** Same as Alternative 1 plus: A2/AQ-O4	**RM-O3. Objective:** Restore aquatic and terrestrial habitats that have a high potential for improvement by reducing road density in areas where roads have been demonstrated to have an adverse effect. Restore and maintain a network of existing high quality habitat to provide a foundation for watershed and habitat recovery.

RM-S8. Standard: Not Applicable.	**RM-S8. Standard:** A2/AQ-S3	**RM-S8. Standard:** To meet the intent of RM-O3, which is to reduce the adverse effects of roads, road miles shall be progressively decreased through permanent closure or obliteration in subwatersheds with high (1.7 - 4.7 miles/square mile) and extreme (>4.7 miles/square mile) road densities; and a downward trend in road miles shall be demonstrated over the life of this EIS. Priorities shall be established as referenced in the road priority tables, which follow the road management objectives and standards. These tables illustrate, by alternative and by forest or range cluster, the priority for road reductions. ***Rationale:*** *This standard is not intended to mandate a desired road density, but rather to emphasize reducing roads in areas of high and extreme road density (see RM-O3), where habitat restoration can be achieved and adverse effects reduced, while maintaining suitable access. Decisions would be made locally and supported by appropriate analysis.*

RM-S8.Forest Cluster Road Density Reduction Priority Table -- applies to forested potential vegetation groups

Cluster	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
1	L	L	L	L	L	L	L
2	L	L	M	M	L	M	M
3	L	L	M	M	M	H	H
4	L	L	M	M	L	M	M
5	L	M	H	H	M	M	H
6	L	L	L	M	L	L	L

RM-S8. Range Cluster Road Density Reduction Priority Table -- applies to rangeland potential vegetation groups

Cluster	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
1	L	L	L	H	M	M	M
2	L	L	L	L	L	L	L
3	L	L	L	M	L	L	M
4	L	L	M	M	L	M	M
5	L	L	L	L	L	L	L
6	L	L	L	M	L	M	M

L = Low priority
M = Moderate priority
H = High priority

RM-S9. Standard: Not Applicable.	**RM-S9. Standard:** A2/AQ-S2 A2/AQ-S3	**RM-S9. Standard:** Existing transportation networks shall be used for conducting management activities in subwatersheds with high (1.7 - 4.7 miles/square mile) and extreme (>4.7 miles/square mile) road densities when feasible. If new roads are proposed for construction through areas of high quality habitat in high to extreme road density subwatersheds, an opportunity for intergovernmental coordination shall be provided early in the planning stage by the Forest Service or BLM.

Road Management

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
Road Construction						
RM-O4. Objective: Varies. See: A1/AQ-O1 A1/AQ-O2 A1/TE-O6 A1/PE-O1	**RM-O4. Objective:** Same as Alternative 1 plus: A2/AQ-O4	**RM-O4. Objective:** Design new road construction to prevent or minimize adverse effects on aquatic/riparian and terrestrial species and their habitat.				
RM-S10. Standard: Varies. See: A1/AQ-S1 A1/AQ-S2 A1/AQ-S3 A1/AQ-G1 A1/AQ-O3	**RM-S10. Standard:** Same as Alternative 1 plus: A2/AQ-S3 A2/AQ-S4	**RM-S10. Standard:** Adverse effects from road and landing construction shall be prevented or minimized to ensure attainment of aquatic, terrestrial, and riparian objectives. Roads and landings should be located outside of Riparian Conservation Areas. (See definition of RCAs in Appendix G). Roads and land-ings may be located in RCAs only after all other practicable alternatives have been eliminated and Ecosystem Analysis at the watershed scale has been completed. For new construction of minor stream crossings that would create only transient effects and are in watersheds that do not require Ecosystem Analysis at the watershed scale, sub-basin review shall be used, where available, along with site-specific NEPA analysis. Also applies to RM-O2.		**RM-S10. Standard:** ***Inside timber and livestock priority areas:*** Not applicable. ***Outside timber and livestock priority areas:*** Same as Alternative 3.	**RM-S10. Standard:** Same as Alternative 3.	**RM-S10. Standard:** Same as Alternative 3.

RM-S10. Rationale: *The primary purpose of RCAs is the restoration and maintenance of riparian and instream processes and functions. It is, therefore, expected that roads and landings will be located outside RCAs. Information from Ecosystem Analysis at the Watershed Scale, as appropriate, may identify exceptions. An intergovernmental collaborative process would help to ensure that exceptions do not compromise the purpose and function of the RCA.*

RM-S11. Standard: Not Applicable.	**RM-S11. Standard:** Not Applicable.	**RM-S11. Standard:** Not applicable.	**RM-S11. Standard:** Not applicable.	**RM-S11. Standard:** ***Inside timber and livestock priority areas:*** To minimize sediment introduction to perennial and intermittent streams, there should be no roads constructed within 150 feet of active channel margins. For existing and necessary new roads within 150 feet of active channel margins, management actions should be taken to mitigate erosion, stabilize fills, maintain culverts and drainage systems, and minimize subsoil disturbance. ***Outside timber and livestock priority areas:*** Not applicable.	**RM-S11. Standard:** Not applicable.	**RM-S11. Standard:** Not applicable.
RM-S12. Standard: Varies. See: A1/AQ-S1 A1/AQ-S2 A1/AQ-S3	**RM-S12. Standard:** Same as Alternative 1 plus: A2/AQ-S5	**RM-S12. Standard:** Construction of all new and reconstruction of existing road crossings of streams and rivers that currently or historically supported native fish species shall maintain or restore fish passage, fish spawning, channel stability, and genetic integrity.				
RM-S13. Standard: Varies. See: A1/AQ-S1 A1/AQ-S2 A1/AQ-S3 A1/PE-O1	**RM-S13. Standard:** Same as Alternative 1 plus: A2/AQ-S3	**RM-S13. Standard:** Road construction and reconstruction shall be designed and conducted to avoid landscapes with high hazard for disruption of hydrologic flow paths and processes. Road construction and reconstruction, maintenance and snow plowing shall be conducted to prevent sediment delivery from the road to streams and Riparian Conservation Areas.				

Road Management

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
RM-S14. Standard: Varies. See: A1/AQ-S1 A1/AQ-S2 A1/AQ-S3	**RM-S14. Standard:** Same as Alternative 1 plus: A2/AQ-S3	**RM-S14. Standard:** Side casting of road materials is prohibited on road segments within or abutting Riparian Conservation Areas. Also applies to RM-O2.				
RM-S15. Standard: Not Applicable.	**RM-S15. Standard:** Not Applicable.	**RM-S15. Standard:** To maintain high quality habitats in subwatersheds with road density classes of none (0 - 0.02 miles/square mile), very low (0.02 - 0.1), or low (0.1 - 0.7), road density shall not increase by more than one road density class or exceed a threshold of 0.7 miles/square mile over the ten-year planning period following signing of the Record(s) of Decision for this EIS. (See also RM-O3.)		**RM-S15. Standard:** ***Inside timber priority areas:*** Not applicable. ***Outside timber priority areas:*** Same as Alternative 3.	**RM-S15. Standard:** See EM-S9 for direction.	**RM-S15. Standard:** See EM-S9 for direction.
		Rationale: *The Science Integration Team found a relationship between low road density and high quality habitats. Roads can increase disturbance, displacement, and direct and indirect mortality to fish and wildlife. Road networks can alter watershed integrity, hydrologic function, sediment regimes, and human use patterns which cannot be entirely mitigated.*				
		Rationale: Alts 3 & 4 Only: *The intent of this standard is to allow restoration and other management without first requiring Ecosystem Analysis in these areas (except as otherwise required by EM-S7, EM-S8, EM-S9, or EM-S10). The intent was not to prohibit road construction in unroaded or low road density areas, but for management to proceed more cautiously due to the correlation with high quality habitat.*				
RM-S16. Standard: Not Applicable.	**RM-S16. Standard:** Not Applicable.	**RM-S16. Standard:** Not applicable.				**RM-S16. Standard:** There shall be no road construction in reserves or unroaded areas larger than 1,000 acreas.

ADAPTIVE MANAGEMENT/MONITORING

ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7

Adaptive Management

AM-O1. Objective: Make appropriate adjustments in management strategies as new information, technology, and social desires are identified.

Rationale: *Adaptive management is a continuing process of action-based planning, monitoring, researching, evaluating and adjusting standards and techniques to improve achievement of the ICBEMP goals and objectives. These standards and techniques are based on scientific knowledge. Ecosystem management uses an adaptive approach and calls for applying the latest scientific information and professional judgement to develop management plans that will most likely meet desired future conditions. To be successful, it must have the flexibility to adapt and respond to new information. Under the concept of adaptive management, new information will be evaluated and decisions made whether to make adjustments or changes as experience is gained from implementing plans. The adaptive management approach will enable resource managers to determine how well management actions meet their objectives and what steps are needed to modify activities to increase success or improve results. See Appendix I. Applies also to PE-O4.*

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
AM-S1. Standard: Varies. See A1/IA-S1	**AM-S1. Standard:** Same as Alternative 1	**AM-S1. Standard:** Adaptive management principles and processes shall be used to adjust management practices to meet ICBEMP goals and objectives. Adaptive management shall include all four parts of the process -- planning, implementation, monitoring, and evaluation as defined in the Implementation appendix (Appendix I). Resources shall be allocated and priorities established so that all parts of adaptive management are completed over an appropriate time frame.				
AM-S2. Standard: Varies. See A1/IA-S1 A1/TE-G13	**AM-S2. Standard:** Same as Alternative 1.	**AM-S2. Standard:** Not applicable.				**AM-S2. Standard:** Adjustments to final reserve boundaries shall be based on project-area-wide bioreserve system needs and consider the following: - Select habitats that support populations of rare, narrowly endemic, or significantly declining species. - Include centers of endemism, rarity, or high biodiversity located on Forest Service- or BLM-administered lands. - Use information from GAP analysis and local assessments for additional areas. - Include at least 10%, but preferably 20 - 30%, of the

Adaptive Management/Monitoring

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
						range of all major vegetation types to large reserves (250,000+ acres) to account for typical disturbance processes. - As needed, replicate vegetation types in reserves in multiple locations within the project area if significant differences exist or the risk of large-scale disturbance is high. - Establish reserves to conserve biodiversity across the landscape and meet needs of groups of plant or animal species communities. - Adjust boundaries using collaborative approach with federal, tribal, state, and county agencies.

Monitoring

Alternative 1	Alternatives 2–7
AM-O2. Objective: Assess the effects of management strategies by monitoring changes in conditions, and take actions as needed to meet plan objectives.	**AM-O2. Objective:** Assess the effects of management strategies by monitoring changes in conditions, and take actions as needed to meet ecosystem management goals. Cooperate with federal, tribal, state, and county governments to develop monitoring and evaluation protocols. Collect and inventory data in a consistent, retrievable, and updatable format to acquire essential information about ecological processes and conditions, causal mechanisms, and inherent capabilities and limitations, that are linked across different scales of time and space and are used to address issues identified by ecosystem and other scale analyses.

***Rationale**: Although monitoring plays a role in current management, it is especially critical to ecosystem management, providing feedback to the adaptive management process. Monitoring allows detection of undesirable and desirable changes so that management actions can be modified or designed to achieve desired goals and objectives while avoiding adverse effects to ecosystems. Current Forest Service and BLM monitoring programs within the project area are not systemically designed to provide monitoring information needed to evaluate management plans at multiple planning scales.*

AM-S3. Standard: Varies. See A1/HU-G1	**AM-S3. Standard:** Same as Alternative 1	**AM-S3. Standard:** Within two years, Forest Service regional and BLM state offices shall develop an integrated intergovernmental monitoring and evaluation protocol, coordinated with research, to determine if acceptable progress toward desired conditions is being achieved. Other federal agencies, tribes, states, counties, and affected stakeholders shall have the opportunity to be involved in developing this protocol. It shall include selected key elements to be monitored to provide desired data at a reasonable cost. At a minimum, key ecosystem health indicators that transcend multiple planning scales for aquatic, terrestrial, vegetation, watershed, and socio-economic resources should be assessed and reported to determine progress in meeting management objectives. See Monitoring section of Implementation appendix (Appendix 1).
AM-S4. Standard: Varies. See A1/IA-S1	**AM-S4. Standard:** Same as Alternative 1	**AM-S4. Standard:** Forest Service regional and BLM state offices shall oversee development and implementation of annual monitoring programs (implementation, effectiveness, and validation) at various scales. Annual report summarizing monitoring results shall be issued.
AM-S5. Standard: Varies. See A1/IA-S1	**AM-S5. Standard:** Same as Alternative 1	**AM-S5. Standard:** Critical monitoring (such as implementation monitoring essential to assure progress toward meeting objectives) shall be implemented immediately as an integral part of projects and programs. Regional and state offices shall cooperate with federal agencies and state, tribal, and county governments to develop consistent protocols for methodologies in collection, transmission, and sharing of monitoring data consistent with AM-S3 for other types of monitoring, such as effectiveness, validation, and baseline monitoring. Prior to the development of regional and state protocols, tier monitoring to the five components described in Appendix 1.
AM-S6. Standard: Varies. See A1/IA-S1 A1/TE-G8	**AM-S6. Standard:** Same as Alternative 1	**AM-S6. Standard:** Riparian area monitoring within all grazing allotments shall be updated to conform with monitoring protocols and evaluation procedures resulting from standard AM-S3 by either modifying annual use plans or revising allotment management plans.
AM-S7. Standard: Varies. See A1/IA-S1	**AM-S7. Standard:** Same as Alternative 1	**AM-S7. Standard:** Monitoring shall be conducted by administrative units (Forest Service district and BLM resource area level) to determine if ICBEMP objectives are being met. If it is determined that objectives are not being met due to current management actions, then management actions should be modified to those more likely to achieve objectives. If it is determined that objectives are not being met due to past management actions, then restoration actions should be implemented that are likely to achieve objectives. If analysis indicates that ICBEMP objectives are not being met due to natural conditions or to processes or actions outside of management control, then new objectives should be developed on the basis of new information.

Accountability

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
A-O1. Objective: Not Applicable.	**A-O1. Objective:** Not Applicable.	**A-O1. Objective:** Forest Service/BLM line officers are accountable to ensure this plan is implemented as described and the line officers are accountable for ensuring participation in plan implementation.				
A-S1. Standard: Not Applicable.	**A-S1. Standard:** Not Applicable.	**A-S1. Standard:** BLM State Directors, Regional Foresters, and their subordinate line officers shall ensure that: - ICBEMP objectives and standards are met; - implementation is consistent; - interagency and intergovernmental collaboration occurs on a timely basis; - employees are trained, an appropriate incentive system is in place, and non-compliance is promptly dealt with; and - consultation occurs with the tribes on a timely basis.				
A-S2. Standard: Not Applicable.	**A-S2. Standard:** Not Applicable.	**A-S2. Standard:** An interagency implementation memorandum of understanding shall be developed between the Forest Service, BLM, and the Regulatory Agencies that will ensure: - interagency collaboration occurs on a timely basis; - streamlined consultation process; - interagency monitoring and adaptive management; - participation in the development of appropriate processes; - participation in executive oversight; and - participation in the dispute resolution process.				
A-S3. Standard: Not Applicable.	**A-S3. Standard:** Not Applicable.	**A-S3. Standard:** Tribal, state, county, and federal agencies and Resource Advisory Councils shall be provided opportunities to participate in implementation oversight groups. (See Implementation Appendix.)				
A-S4. Standard: Not Applicable.	**A-S4. Standard:** Not Applicable.	**A-S4. Standard:** Measurable standards that will not weaken the ability of the ecosystem to meet the ICBEMP Desired Range of Future Conditions shall be implemented following Ecosystem Analysis or site-specific NEPA analysis. (See also EM-13.)				

Table 3-6. Management Activities on UCRB Forestlands

Forest Cluster	Harvest dry	Harvest moist	Harvest cold	Harvest Total	Thin dry	Thin moist	Thin cold	Thin Total	Prescribed Burning dry	Prescribed Burning moist	Prescribed Burning cold	Prescribed Burning Total	Water-shed Restr.	Roads* Decrs. (%)
	ACRES (thousands per decade)													
	Acres (thousands per decade)													
ALTERNATIVE 1														
	dry	moist	cold	**Total**	dry	moist	cold	**Total**	dry	moist	cold	**Total**		
1	6-8	25-30	4-7	35-45	4-*6	4-6	2-3	10-15	40-55	30-45	25-30	95-130	60-80	0-25
2	50-40	200-275	30-35	280-380	45-60	40-55	30-45	115-155	65-85	55-70	40-55	160-210	90-120	0-25
3	35-45	135-185	20-27	190-260	50-65	45-60	35-45	130-170	30-40	25-30	15-25	70-95	35-45	0-25
4	90-115	365-505	47-70	505-690	120-165	110-150	90-120	320-435	60-85	50-70	40-55	150-210	100-135	0-25
5	5-8	25-30	5-7	35-45	8-10	7-9	5-6	20-25	4-6	3-5	3-4	10-15	5-10	0-25
6	15-20	55-70	10-15	80-105	20-25	15-20	10-15	45-60	15-20	15-20	10-15	40-55	30-45	0-25
Total	205-275	810-1095	110-115	**1125-1525**	245-330	220-300	175-230	**640-860**	210-290	180-240	135-185	**525-715**	**320-435**	
ALTERNATIVE 2														
1	6-8	34-50	5-4	45-65	6-9	10-14	4-4	20-30	40-55	30-45	25-30	95-130	175-230	0-25
2	15-20	80-105	10-15	105-140	25-35	40-50	15-25	80-110	65-85	55-70	40-55	160-210	285-380	0-25
3	15-20	90-120	15-20	120-160	20-30	35-45	15-20	70-95	30-40	25-30	15-25	70-95	120-160	0-25
4	20-27	120-165	20-23	160-215	90-115	135-190	75-95	300-400	60-85	50-70	40-55	150-210	100-140	0-25
5	1-2	8-11	1-2	10-15	5-6	7-10	3-4	15-20	4-6	3-5	3-4	10-15	5-10	25-50
6	4-5	23-30	3-5	30-40	8-10	10-15	7-10	25-35	15-20	15-20	10-15	40-55	30-45	0-25
Total	60-80	360-485	50-70	470-635	155-205	235-320	120-165	510-690	210-290	180-240	135-185	525-715	715-965	
ALTERNATIVE 3														
1	7-8	14-17	4-5	25-30	10-14	10-14	5-7	25-35	90-120	90-120	40-55	220-295	175-230	0-25
2	40-60	90-125	25-30	155-215	60-80	60-80	35-45	155-205	145-195	150-200	60-85	355-480	285-380	25-50
3	40-60	90-125	25-30	155-215	50-70	50-70	30-35	130-175	60-80	60-80	25-35	145-195	120-160	25-50
4	105-140	220-295	55-75	380-510	170-230	170-230	80-115	420-575	80-110	80-110	40-50	200-270	100-140	25-50
5	7-8	14-17	4-5	25-30	14-1/8	14-18	7-9	35-45	8-12	8-12	4-6	20-30	5-10	50+
6	10-18	25-35	10-12	45-65	35-45	35-45	15-25	85-115	40-55	40-55	20-30	100-140	30-45	0-25
Total	215-290	450-615	120-160	**785-1065**	340-460	340-460	170-230	**850-1150**	425-575	430-580	185-255	**1040-1410**	**715-965**	
ALTERNATIVE 4														
1	10-14	15-20	5-6	30-40	15-20	11-15	9-10	35-45	135-185	105-140	75-100	315-425	175-230	0-25
2	65-85	95-125	20-35	180-245	120-150	85-115	60-85	260-350	215-290	165-225	125-165	505-680	445-605	25-50
3	50-65	75-95	15-25	140-185	175-105	60-80	40-50	175-235	75-105	60-80	40-50	175-235	120-160	25-50
4	100-145	160-220	45-50	305-410	200-280	155-205	115-160	470-645	185-250	140-190	100-135	425-575	290-390	25-50
5	7-10	10-15	3-5	20-30	15-20	11-15	9-10	35-45	15-20	10-15	5-10	30-45	15-25	50+
6	20-23	25-35	5-7	50-65	45-60	35-50	30-35	110-145	55-75	40-55	30-40	125-170	30-45	25-50
Total	250-340	380-510	95-125	**725-975**	470-635	355-480	260-350	**1085-1465**	680-925	520-700	375-505	**1575-2130**	**1075-1455**	

Table 3-6. Management Activities on UCRB Forestlands (continued).

ACRES (thousands per decade)															
Forest	Harvest				Thin				Prescribed Burning				Water-shed	Roads* Decrs.
Cluster	dry	moist	cold	**Total**	dry	moist	cold	**Total**	dry	moist	cold	**Total**	Restr.	(%)
Acres (thousands per decade)														
ALTERNATIVE 5														
1	5-7	25-32	0	30-40	10-15	20-25	5-10	35-50	40-55	60-80	20-25	120-160	175-235	0-25
2	25-35	115-155	0	140-190	45-60	65-90	20-25	130-175	130-165	165-225	50-65	340-455	285-380	0-25
3	25-35	115-155	0	140-190	62-81	85-110	25-35	170-225	50-70	75-100	20-30	145-200	120-160	25-50
4	105-135	405-545	5-15	515-695	165-225	235-320	75-95	25-35	65-90	95-130	30-40	190-260	100-135	0-25
5	4-5	16-20	0	20-25	10-13	12-17	3-5	475-640	7-9	10-12	3-4	20-25	15-25	25-50
6	17-20	70-100	0	90-125	31-40	40-55	9-15	80-110	35-45	50-70	15-20	100-135	30-45	0-25
Total	180-240	750-1010	5-15	**935-1265**	325-435	455-615	135-185	**915-1235**	325-435	455-615	135-185	**915-1235**	**725-980**	
ALTERNATIVE 6														
1	5-6	7-10	3-4	15-20	20-25	15-20	10-20	45-65	100-135	80-105	55-75	235-315	175-230	0-25
2	35-55	55-65	10-15	100-135	95-130	75-100	55-75	225-305	160-220	125-170	85-120	375-510	280-380	25-50
3	25-30	30-45	10-15	65-90	55-75	45-60	30-40	130-175	65-90	50-70	40-50	155-210	120-160	50+
4	80-110	110-155	30-40	220-305	195-260	150-200	105-145	450-605	180-240	125-180	95-130	400-545	290-390	25-50
5	5-6	7-10	3-4	15-20	13-17	10-13	7-10	30-40	10-15	10-12	5-8	25-35	15-25	25-50
6	10-12	15-17	5-6	30-35	25-30	20-25	10-20	55-75	45-60	35-40	35-40	105-140	30-45	0-25
Total	160-220	225-305	60-80	**445-605**	405-545	310-420	220-300	**935-1265**	560-760	425-575	310-420	**1295-1755**	910-1230	
ALTERNATIVE 7														
1	2-3	5-6	1-2	8-11	6-9	2-3	2-3	10-15	30-40	10-15	10-15	50-70	60-80	0-25
2	20-25	35-50	5-8	60-85	30-35	10-15	10-15	50-65	100-135	35-45	40-55	175-235	90-120	25-50
3	30-40	55-75	5-8	90-125	35-45	10-15	15-20	60-80	115-155	40-55	50-6+5	205-275	35-4560	50+
4	65-87	130-180	15-17	210-280	95-135	35-45	40-50	170-230	250-340	90-120	100-135	440-595	100-135	25-50
5	3-4	6-9	1-2	10-15	9-15	3-5	3-5	15-20	30-40	10-15	10-150	50-70	5-10	50+
6	10-14	20-25	5-6	35-45	15-20	5-7	5-8	25-35	60-80	20-30	25-30	105-140	30-45	0-25
Total	130-180	255-345	30-40	415-565	190-260	65-90	75-100	330-450	585-790	205-275	235-320	1025-1385	320-435	

* includes primarily native surface roads.

Table 3-7. Management Activities on UCRB Rangelands.

Range Cluster	Livestock Management				Improve Rangelands				Prescribed Burning				Riparian Restr.	Roads* Decrs. (%)
	dry grass	dry shrub	cool shrub	**Total**	dry grass	dry shrub	cool shrub	**Total**	dry grass	dry shrub	cool shrub	**Total**		
	Acres (thousands per decade)													
ALTERNATIVE 1														
1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	0	5-15	0	5-15	0	0	0	0	0	0	0	0	0	0-25
3	0	5-10	0	5-10	0	0	0	0	0	0	0	0	0	0-25
4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5	55-65	155-210	55-75	265-350	35-45	100-135	35-45	170-225	90-120	0	40-50	130-170	20-25	0-25
6	30-50	90-110	30-40	150-200	20-30	60-85	20-30	100-145	50-70	0	25-35	75-105	15-20	0-25
Total	85-115	255-345	85-115	**425-575**	55-75	160-220	55-75	**270-370**	140-190	0	65-85	**205-275**	**35-45**	
ALTERNATIVE 2														
1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	0	5-10	0	5-10	0	0	0	0	0	0	0	0	0	0-25
3	0	5-10	0	5-10	0	0	0	0	0	0	0	0	0	0-25
4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5	125-160	505-690	160-210	79-1060	25-35	110-150	35-50	170-235	85-105	0-5	45-65	130-175	20-25	0-25
6	65-95	295-385	90-130	450-610	15-20	65-90	20-25	100-135	45-60	0-5	30-35	75-100	15-20	0-25
Total	190-255	810-1095	250-340	**1250-1690**	40-55	175-240	55-75	**270-370**	130-165	0-10	75-100	205-275	35-45	
ALTERNATIVE 3														
1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	0	5-10	0	5-10	0	0	0	0	0	0	0-5	0-5	0	0-25
3	0	5-10	0	5-10	0	0	0	0	0	0	0-5	0-5	0	0-25
4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5	120-160	550-750	120-160	790-1070	75-105	365-490	75-105	515-700	100-135	0	290-385	390-520	60-90	0-25
6	65-90	320-420	65-90	450-600	45-60	210-285	45-60	300-405	20-25	0	55-70	75-95	40-50	0-25
Total	185-250	880-1190	185-250	**1250-1690**	120-165	575-775	120-165	**815-1105**	120-160	0	345-465	465-625	100-140	
ALTERNATIVE 4														
1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	0	5-10	0	5-10	0	0	0	0	0	0	0-5	0-5	0	0-25
3	0	5-10	0	5-10	0	0-5	0	0-5	0	0	0-5	0-5	0	25-50
4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5	210-285	1055-1435	140-195	1405-1915	80-105	390-520	50-70	520-695	65-85	25-35	300-385	390-505	70-100	0-25
6	120-160	595-790	80-105	795-1055	70-95	350-485	50-60	470-640	10-20	5-10	60-80	75-110	30-40	25-50
Total	330-445	1660-2245	220-300	**2210-2990**	150-200	740-1010	100-130	**990-1340**	75-105	30-45	360-475	465-625	100-140	

Table 3-7. Management Activities on UCRB Rangelands (continued).

Range Cluster	Livestock Management				Improve Rangelands				Prescribed Burning				Riparian Restr.	Roads* Decrs. (%)
	dry grass	dry shrub	cool shrub	**Total**	dry grass	dry shrub	cool shrub	**Total**	dry grass	dry shrub	cool shrub	**Total**		
	Acres (thousands per decade)													
ALTERNATIVE 5														
1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	0	5-10	0	5-10	0	0	0	0	0-5	0	0	0-5	0	0-25
3	0	5-10	0	5-10	0	0-5	0	0-5	0-5	0	0	0-5	0	0-25
4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5	35-55	635-845	120-165	790-1065	10-15	135-175	25-35	170-225	85-105	10-15	40-50	135-170	60-90	0-25
6	25-30	360-485	65-90	450-605	15-20	245-330	45-65	305-415	55-65	0-5	20-30	75-100	40-50	0-25
Total	60-85	1005-1350	185-255	**1250-1690**	25-35	380-510	70-100	**475-645**	140-180	10-20	60-80	210-280	100-140	
ALTERNATIVE 6														
1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	0	5-10	0	5-10	0	0-5	0	0-5	0	0	0-5	0-5	0	0-25
3	0	5-10	0	5-10	0-5	0	0	0-5	0	0	0-5	0-5	0	0-25
4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5	210-285	1055-1425	140-195	1405-1905	25-35	130-170	15-25	170-230	70-85	25-30	295-395	390-510	60-90	0-25
6	120-160	595-800	80-105	795-1065	50-60	225-305	30-40	305-405	10-20	10-15	55-70	75-105	40-50	25-50
Total	330-445	1660-2245	220-300	**2210-2990**	75-100	355-480	45-65	**475-645**	80-105	35-45	350-475	465-625	100-140	
ALTERNATIVE 7														
1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0-25
3	0	0-5	0	0-5	0	0	0	0	0	0	0	0	0	25-50
4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5	95-135	200-265	100-135	395-535	40-60	85-120	45-55	170-235	50-70	40-50	295-390	385-510	20-30	0-25
6	80-105	155-210	80-105	315-420	25-30	50-70	25-35	100-135	10-15	5-10	60-85	75-110	40-50	25-50
Total	175-240	355-480	180-240	**710-960**	65-90	135-190	70-90	**270-370**	60-85	45-60	355-475	460-620	60-80	

*Includes primarily native surface roads.

Comparison of Alternatives

This section compares the seven alternatives in three ways. First, the theme of each alternative is briefly stated in Table 3-8. Second, a comparison is made between the "No Action" alternatives (Alternatives 1 and 2) and the "Action" alternatives (Alternatives 3 through 7). Third, a relative comparison of the effects of the alternatives is made, summarizing the estimation of effects described in detail in Chapter 4.

Table 3-8. Comparison of Alternatives by Theme

Alternative 1. No Action

Continues management specified under existing Forest Service or BLM land-use plans. Includes direction from current plans for 17 National Forests and 20 BLM Resource Areas.

Alternative 2

Applies recent interim direction (PACFISH and INFISH) as the long-term strategy for lands administered by Forest Service or BLM. All other direction from existing plans would continue. Direction in Alternative 1 would apply to areas not covered by interim direction.

Alternative 3

Updates existing Forest Service or BLM plans in response to changing conditions. Minimizes changes to local plans, addressing only priority conditions that most hinder effectiveness or legal conditions. Provides a broader dimension and more integrated management regarding priority large-scale issues than Alternatives 1 or 2.

Alternative 4

Aggressively restores ecosystem health through active management using an integrated ecosystem management approach. Priority is placed on forest, rangeland, and watershed health. Actions are designed to produce economic benefits whenever practical.

Alternative 5

Emphasizes production of goods and services consistent with ecosystem management principles. Areas are targeted for specific uses based on biological capability and economic efficiency; other uses may occur but conflicts would be resolved in favor of the priority use.

Alternative 6

Emphasizes an adaptive management approach to restore and maintain ecosystems while providing for social and economic needs. Takes a slower, more cautious approach than other alternatives and implies the use of experimental processes, local research, and extensive monitoring.

Alternative 7

Emphasizes reducing risks to ecological integrity and species viability by establishing a system of reserves lands administered by the Forest Service or BLM. Reserves are selected for representation of vegetation and rare animal species. Management activities are limited within reserves and are similar to Alternatie 3 outside reserves.

Differences Between the Alternatives

In general, there are several differences between the "no action" alternatives, which reflect current BLM and National Forest land and resource management plans, and the "action" alternatives. There are 75 BLM and National Forest management plans within the project area. Many aspects of these existing plans are still accurate and appropriate, as are many approaches to dealing with local issues. Certain broader scale issues, however, have been more challenging to resolve on a unit by unit basis. These plans were approved over a 15- to 20-year time period, and they do not reflect consistent approaches to broad-ranging issues, such as declines in cold water fish and riparian habitat, concerns about mature or old forests, and the expansion of exotic weed species. The "action" alternatives attempt to portray consistent interagency approaches to these broad-ranging issues, as well as applications of evolving ecosystem management principles. Alternatives 1 and 2 represent existing Forest Service and BLM land-use plans and current direction. The management of Forest Service- or BLM-administered lands would shift in varying degrees towards an ecosystem-based landscape approach under Alternatives 3 through 7. This means that these lands would be managed as a whole within watersheds and as connected lands between watersheds. Where forestland and rangeland are intermingled within watersheds, or between watersheds, they would be managed for connected flows of resources and habitats. Hydrologic and riparian systems within watersheds would be managed as integral networks of forest and rangelands. Through time, the implementation of activities to restore landscapes and produce commodities would be prioritized to achieve integrated landscape, aquatic, and terrestrial integrity and social and economic resilience, and would be concentrated in time and space to better reflect the biophysical template.

Some of the more substantial differences between the "no action" and "action" alternatives are as follows:

"No Action" Alternatives (Alternatives 1 and 2)	"Action" Alternatives (Alternatives 3 through 7)
Many current plans describe desired future conditions but have emphasis on commodity production with mitigation for other resource values. In forested ecosystems, these plans typically reflect more traditional approaches, emphasizing even-aged management with small patch sizes scattered across the landscape. On land suitable and available for timber production, timber yields were optimized within the constraints of standards and guidelines, often relying on improved genetic stocks and in some cases, fertilization. Timber volume generally is produced from all size classes, including large diameter trees. On rangelands, among other things, strategies often equate stocking levels of domestic livestock with the capacity of the land. There is less emphasis on managing the landscape in ways similar to how native species evolved.	Focus is on developing old trees and late seral structure where it has declined throughout the basin, to reflect conditions expected under more natural disturbance regimes. Most volume comes from smaller size and age classes from thinnings or removal of smaller trees to enhance development of residual overstory trees. On both forest and rangelands, more reliance on the use of prescribed fire to restore patterns and structure more consistent with those in which these systems evolved.

Continued on the next page

There is no overall cold water aquatic and riparian management strategy. Parts of the planning area are covered under PACFISH or INFISH. Some of the rangelands are not covered by any of these and rely on what is in the respective plans.	More common consistent approach to managing aquatic and riparian resources, with primary management goals and objectives to maintain or improve aquatic/riparian functions and processes. Strategies in these alternatives address the linkages between riparian areas and uplands, relating this to overall watershed function.
Although current plans generally include prescribed fire, thinning, and other vegetative management activities, there is little emphasis on working with natural disturbance patterns and processes across the landscape.	More emphasis on effectively working with natural disturbance patterns and processes across landscapes.
Generally, current plans were the best attempt at the time to provide sustainable goods and services for people.	Emphasis on appropriate ecosystem analysis to determine desirable patterns, structure and composition of vegetation that more closely considers natural disturbance events and regimes. Emphasis is on what patterns, structure, and composition are desirable to carry into the future. Resource outputs exceeding those needs available for social and economic benefits to society.
Same as above.	Activity locations and expected management treatments would be more closely focused on restoring ecosystem function, process, and structure.
Public participation in natural resource decision making is generally driven by NEPA, and the emphasis varies by administrative unit.	Stronger emphasis on how decisions are made on public lands. Recognize the need for meaningful participation at all levels, and recognize unique needs and contributions of tribes and local governments.
Most land-use plans were developed prior to the Forest Service and BLM adopting policies of ecosystem-based approaches to management activities. Existing plans often recognized that current conditions may differ from desired conditions. Now there is better understanding of how the ecosystems function and are influenced by Forest Service and BLM management activities and natural events and processes.	Recognize that some systems have elements that reflect shifts from healthy functioning conditions, which have occurred for several reasons over a long period of time. Effects of past management from timber harvest, livestock grazing, road construction, and fire exclusion have altered systems. Some of this is desired by society, while some creates long-term challenges. Other events, such as climate cycles, exotic weed expansion, and management of non-Federal lands influence how these Federal lands are managed, and vice versa. These interactions are more fully considered than under existing plans.

Comparison of the Effects of the Alternatives

Chapter 4 describes the environmental consequences of the alternatives in detail. This section provides a summary of those effects, using a relative comparison among alternatives for the ten evaluation criteria (see sidebar below).

The EIS Team developed the evaluation criteria to reflect the *Purpose and Need* statement and *issues* in Chapter 1 and *goals* for the alternatives in Chapter 3. The action alternatives (Alternatives 3 through 7) were developed to respond to the evaluation criteria. With the diversity of species, physical environments, landscape conditions, trends, communities, and cultures in the planning area, it would not be possible for any alternative to fully meet all the evaluation criteria. In some cases, fully meeting one criterion could lead to risks and trade-offs in other criteria.

Each evaluation criterion is made up of one or more subparts, called *indicator variables.* These variables (both individually and in combination) give a relative indication, based on findings of the Science Team, of how well the alternatives respond to the evaluation criteria. The alternatives were graphed for each indicator variable using a relative ranking system with a scale of 0 to 10. The alternative that rated the highest was assigned a rating of 10 and the other alternatives were rated relative to that alternative.

Indicator variables are made up of one or more *causal variables.* In most cases, the graphs of indicator variables, with reference to their respective causal variables, were adequate to illustrate the relative ranking of alternatives. In a few cases, causal variable graphs were included.

Following the graphs are a few paragraphs for each evaluation criterion summarizing the relative effects among alternatives. The evaluation criteria process provided valuable information in the selection of a Preferred Alternative. For more detailed information on the effects, see Chapter 4 of this Draft EIS, (Environmental Consequences), or the *Evaluation of EIS Alternatives by the Science Integration Team* (Quigley, Lee, and Arbelbide 1997).

The following evaluation criterion summaries are based on indicator variable rankings among alternatives in combination with information from Chapter 4.

Evaluation Criteria ~ Ten questions reflecting the Purpose and Need, issues, and goals used to rank the effects of the alternatives relative to each other.

Indicator Variables ~ The components of evaluation criteria, which are themselves made up of causal variables.

Ranking ~ For each indicator variable, the alternative that rated the highest was assigned a rating of 10. The other alternatives were rated relative to that alternative. The ranking of indicator variables is for both short-term (10 years) and long-term (50 to 100 years) effects unless otherwise noted.

Evaluation Criteria / Indicator Variables

1. **To what extent does each alternative affect forest health and natural disturbance processes?**
   - IV#1 Stand Structure and Composition
   - IV#2 Ecosystem Process and Function
   - IV#3 Resilience to Stresses

2. **To what extent does each alternative affect rangeland health and natural disturbance processes?**
   - IV#1 Noxious Weeds
   - IV#2 Woody Species
   - IV#3 Restoration
   - IV#4 Grazing Pressure
   - IV#5 Ecosystem Analysis at the Watershed Scale

3. To what extent does each alternative affect aquatic and riparian health?

IV#1 Watershed, Aquatic, and Riparian Protection
- Standards
- RCAs

IV#2 Watershed, Aquatic, and Riparian Restoration
- Road Decommissioning and Obliteration
- Road Closure
- Restoration Acres

IV#3 Short-term Risk and Uncertainty
- Ecosystem Analysis at the Watershed Scale
- Management Disturbance

IV#4 Long-term Risk and Uncertainty

IV#5 Habitat to Support Viable Fish Populations

4. To what extent does each alternative affect landscape health?

IV#1 Landscape Health
- Short-term
- Long-term

IV#2 Landscape Health Cost

5. How does each alternative contribute to long-term viable populations of terrestrial species?

IV#1 All Species at-risk
IV#2 Riparian Associated Species at-risk
IV#3 Snag/downed Wood Dependent Species at-risk
IV#4 Species at-risk Improved by Upland Restoration
IV#5 Species at-risk Improved by Lower Road Density
IV#6 Fewest Unfavorable Habitat Outcomes for Species at-risk

6. How does each alternative contribute to long-term recovery and delisting of threatened and endangered species?

IV#1 Bald Eagle
IV#2 Fish

7. To what extent does each alternative respond to Federal trust responsibilities and tribal rights and Interests?

IV#1 Effective Consultation
IV#2 Tribal Rights and Interests
IV#3 Access
IV#4 Places: Specific Landscapes Based on Meanings and Images
IV#5 Ethno-habitats Usability

8. What annual level of goods and services is provided by each alternative?

IV#1 Livestock Production
IV#2 Timber Volume
IV#3 Recreation Value

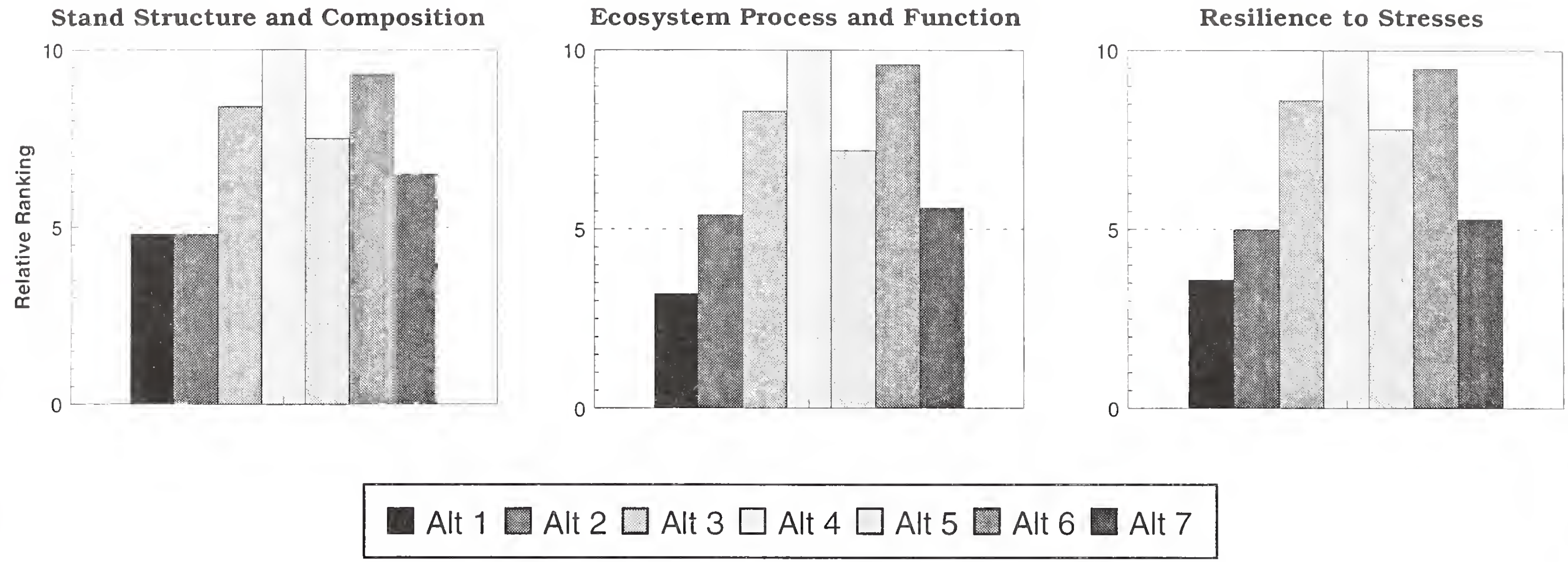
9. What are the effects of each alternative on community vitality and resiliency?

IV#1 Timber Jobs
IV#2 Ranching Jobs
IV#3 Recreation Jobs
IV#4 Restoration Jobs

10. What are the effects of each alternative on quality of life for project area residents?

IV#1 Environmental Risk Reduction (short-term and long-term)
IV#2 Economic Opportunity

EC 1: To what extent does each alternative affect forest health and natural disturbance processes?

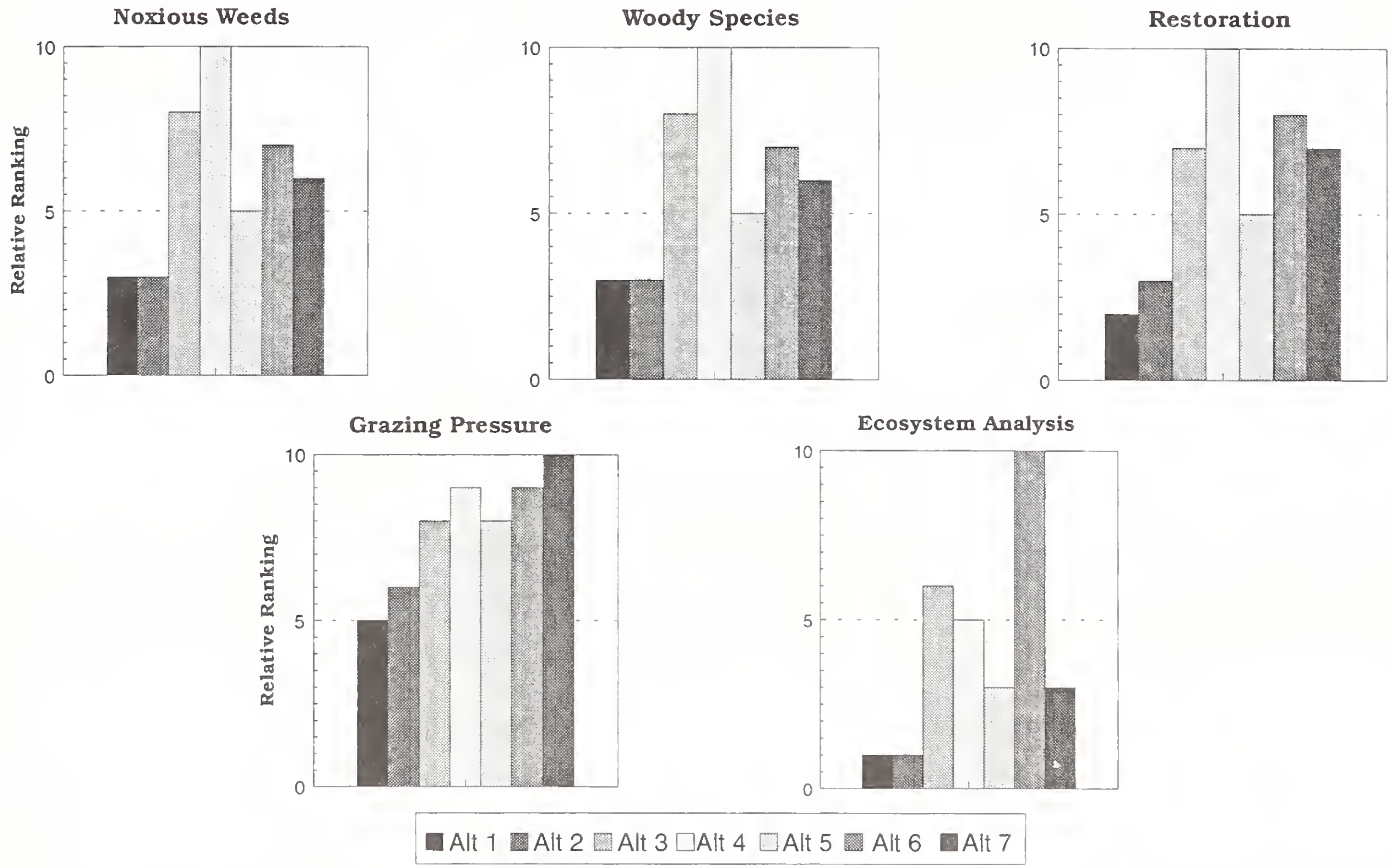


Stand Structure and Composition: Long-term relative ranking of alternatives based on projected similarity to Historical Range of Variability using the following stand characteristics: 1) structure of young, mature, and old forests; 2) large tree component; and 3) tree species composition; and 4) density.

Ecosystem Process and Function: Long-term relative ranking of alternatives based on projected 1) coarse woody debris levels; 2) soil disturbance; 3) nutrient cycling; 4) road restoration; 5) hydrologic function; and 6) carbon cycling.

Resilience to Stresses: Long-term relative ranking of alternatives based on the ecosystem's projected ability to withstand the following stresses: 1) wildfire; 2) insects and disease; 3) climatic; and 4) noxious weeds.

EC 2: To what extent does each alternative affect rangeland health and natural disturbance processes?



Noxious Weeds: Relative ranking of alternatives based on effectiveness in reducing the spread of weeds using IWM standards, road management standards, and management activity tables for range improvement.

Woody Species: Relative ranking of alternatives based on effectiveness in reducing the density of juniper, conifers and sagebrush using standards and management activity tables for range improvement and prescribed burning.

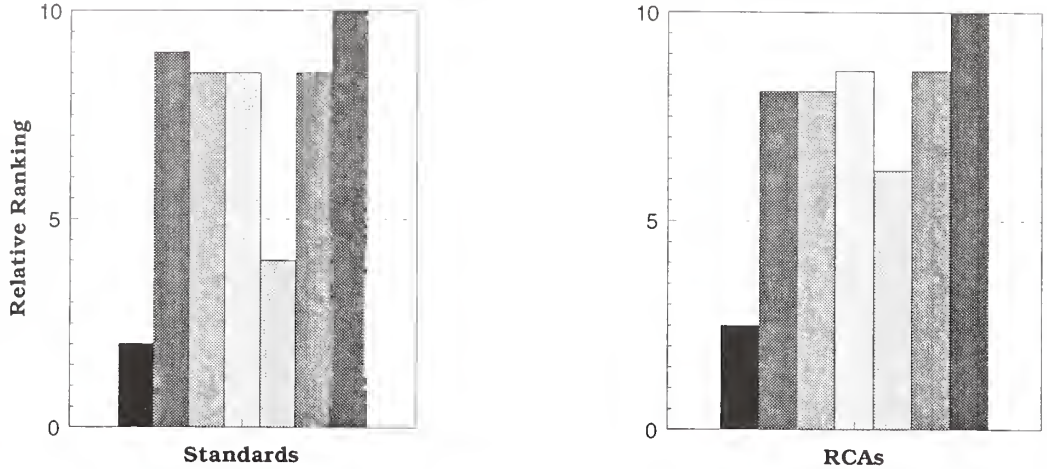
Restoration: Relative ranking of alternatives based on effectiveness in restoring rangelands using standards and management activity tables for livestock management and range improvement.

Grazing Pressure: Relative ranking of alternatives based on effectiveness in reducing grazing pressure on rangelands using the standards and management activity tables for livestock management.

Ecosystem Analysis: Short-term relative ranking of alternatives based on effectiveness in reducing risk of management actions using the amount of acreage requiring ecosystem analysis.

EC 3: To what extent does each alternative affect aquatic and riparian health?

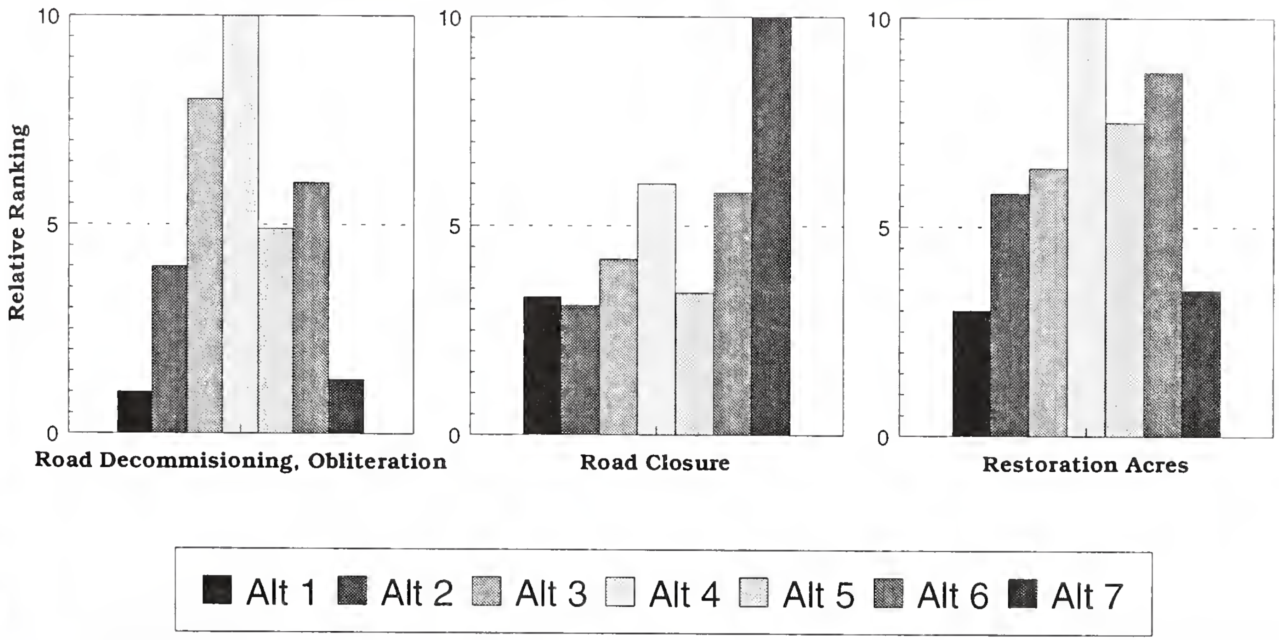
Watershed, Aquatic, and Riparian Protection



Standards: Short-term relative ranking of alternatives based on the protective or conservative nature of aquatic and riparian management standards. The highest bar reflects the most conservative management approach.

RCAs: Short-term relative ranking of alternatives based on the amount of land within Riparian Conservation Areas (RCAs), with the highest bar reflecting the greatest area. Alternatives 2 through 7 do not account for landslide prone areas. Also, the slope adjustment factor is not included in Alternatives 4, 5, and 6 which would increase RCA area.

Watershed, Aquatic, and Riparian Restoration

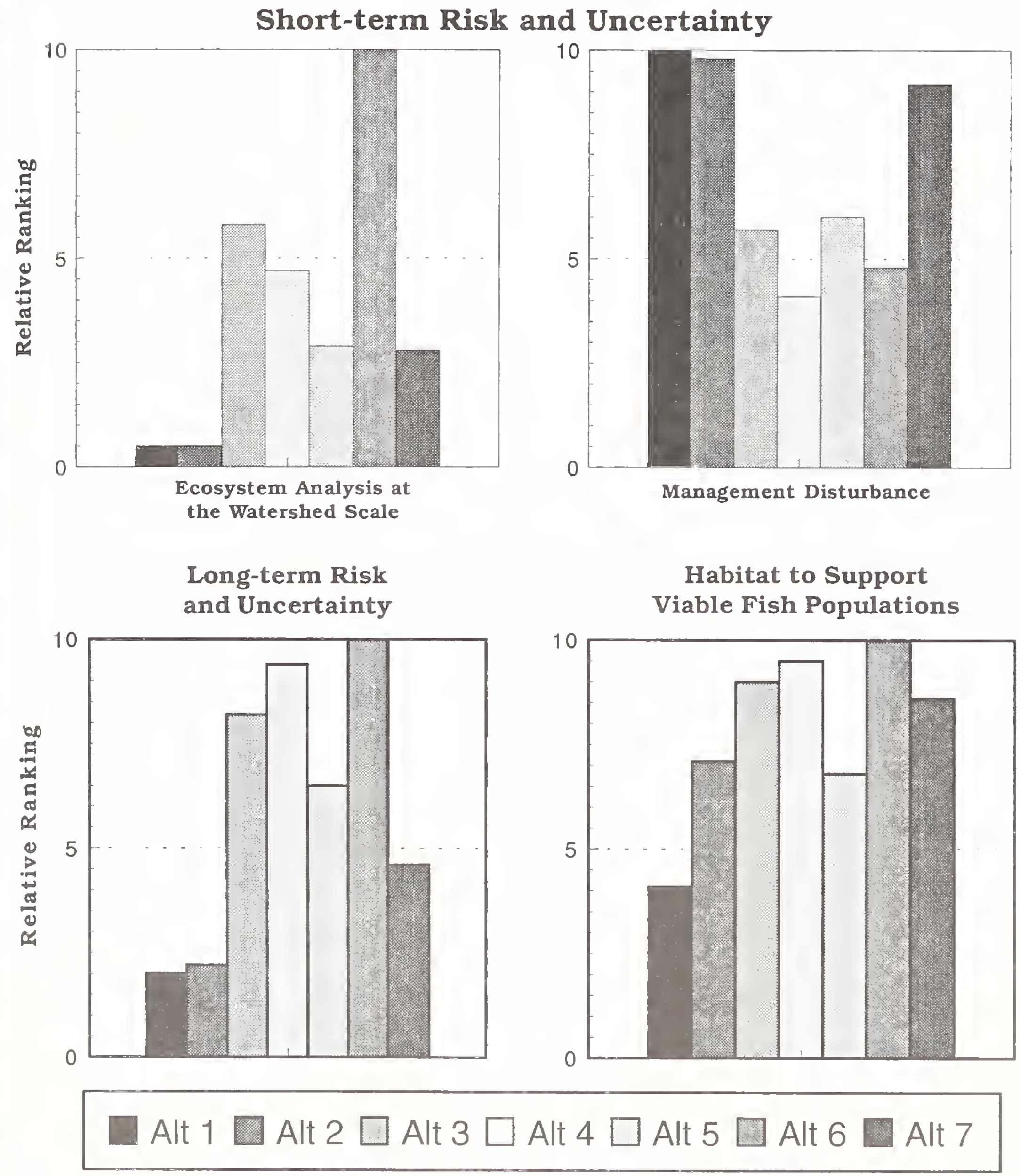


Road Decommissioning and Obliteration: Short-term relative ranking of alternatives based on road decommission and obliteration miles used in the cost analysis. The highest bar reflects the greatest amount of road decommissioning and obliteration.

Road Closure: Short-term relative ranking of alternatives based on road closure miles used in the cost analysis. The highest bar reflects the greatest amount of road closure.

Restoration Acres: Short-term relative ranking of alternatives based on the amount of watershed and riparian restoration acres shown in the activity tables with the highest bar reflecting the greatest amount.

EC 3: To what extent does each alternative affect aquatic and riparian health? (continued)



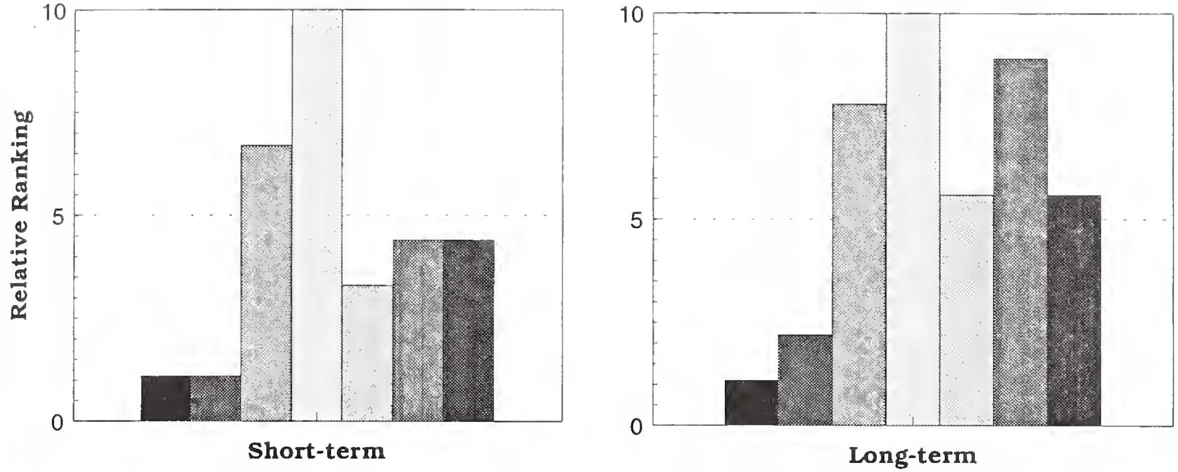
Ecosystem Analysis at the Watershed Scale: Short-term relative ranking of alternatives based on the potential amount of ecosystem analysis at the watershed scale. The assumption is that ecosystem analysis at the watershed scale reduces short term risk (<10 years) and uncertainty of outcomes to watershed, aquatic, and riparian resources. The highest bar reflects the alternative with the greatest potential amount of ecosystem analysis at the watershed scale.

Management Disturbance: Short-term relative ranking of alternatives based on the amount of management activities shown in the activity tables excluding road decommissioning, obliteration, and closure. The assumption is that the greater the rate of managment activity, the higher liklihood of short term risk (<10 years) to watershed, aquatic, and riparian resources. The highest bar reflects the alternative with the lowest short term risk as measured by activity rate.

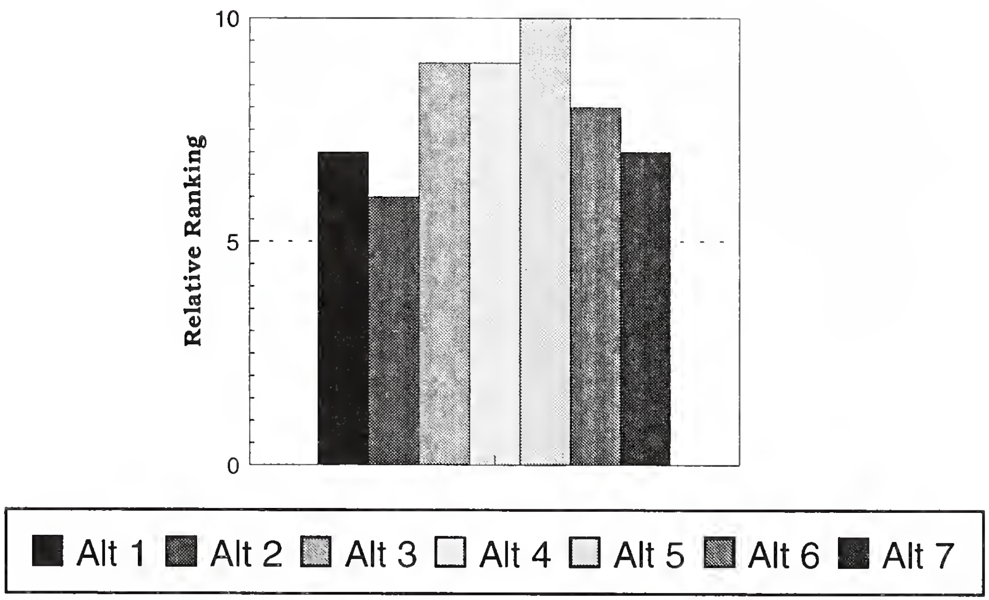
Long-Term Risk and Uncertainty: Long-term relative ranking of alternatives based on the similarity of landscape pattern, disturbance regime, and vegetation structure to historic. The assumption is that the greater the similarity to historic conditions, the lower the risk to watershed, aquatic, and riparian resources in the long term (50-100 years). The highest bar reflects the alternative with the greatest similarity to historic.

Habitat to Support Viable Fish Populations: Long-term relative ranking of alternatives based on the previous aquatic and riparian indicator variables. The highest bar reflects the alternative that best maintains viability requirements for fish species.

EC 4: To what extent does each alternative affect landscape health?

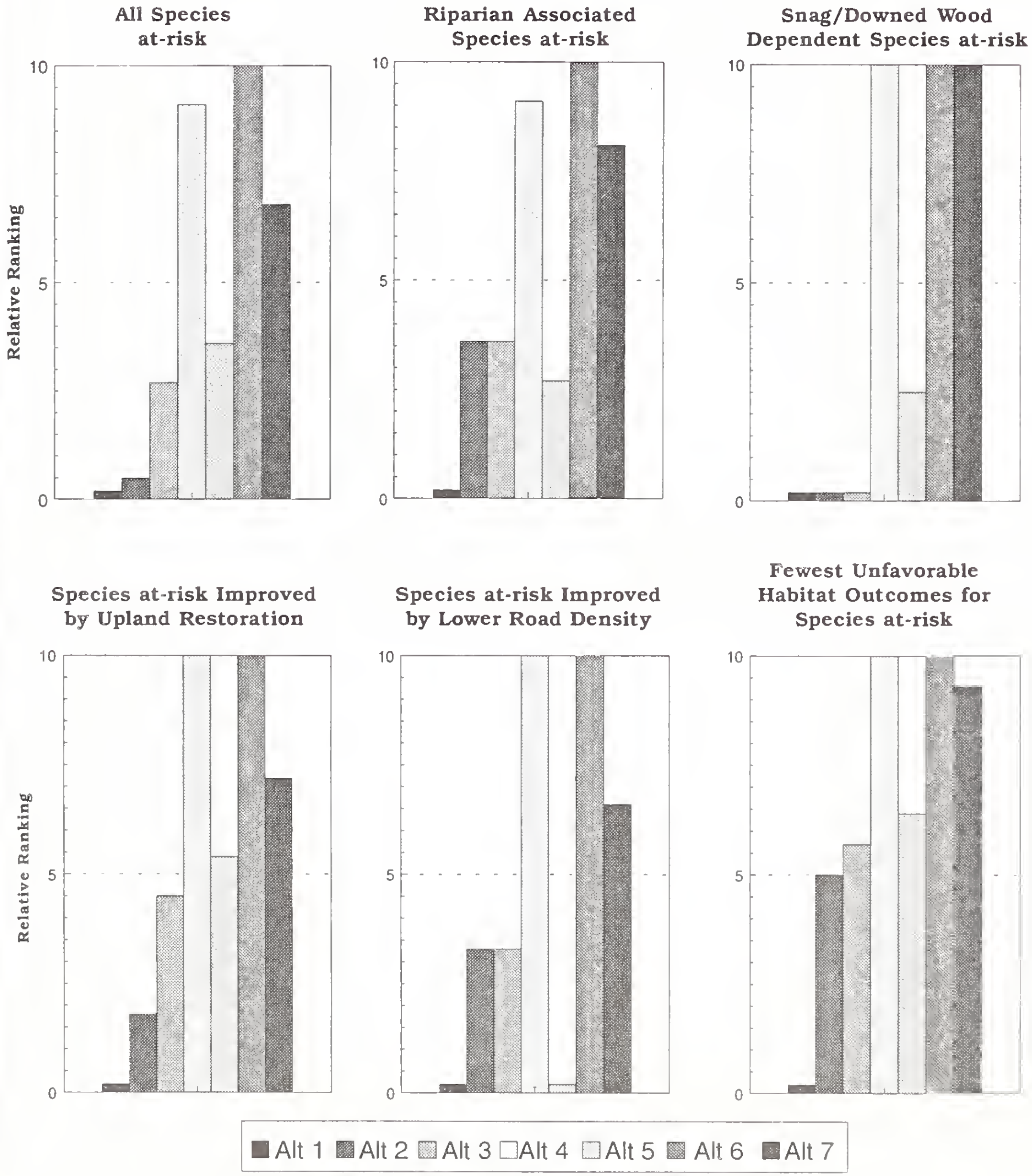


Short-term and Long-term Landscape Health: Relative ranking of alternatives based on consistency of landscape patterns with their appropriate biophysical succession/disturbance regimes, associated reduction in soil disturbance, exotic species invasion, conservation of landscape scale terrestrial and aquatic species habitats, fire risk reduction in the urban-rural/wildland interface, and associated flow of commodities and amenities.



Landscape Health Cost: Relative ranking of alternatives based on costs of land management activity and wildfire suppression.

EC 5: How does each alternative contribute to long-term viable populations of terrestrial species?



All Species At-Risk: Long-term relative ranking of alternatives based on improved habitat outcomes of all species listed in Table 4-41.

Riparian Associated Species At-Risk: Long-term relative ranking of alternatives based on improved habitat outcomes for a selected group of species from Table 4-41 and riparian restoration/protection in standards and activity tables.

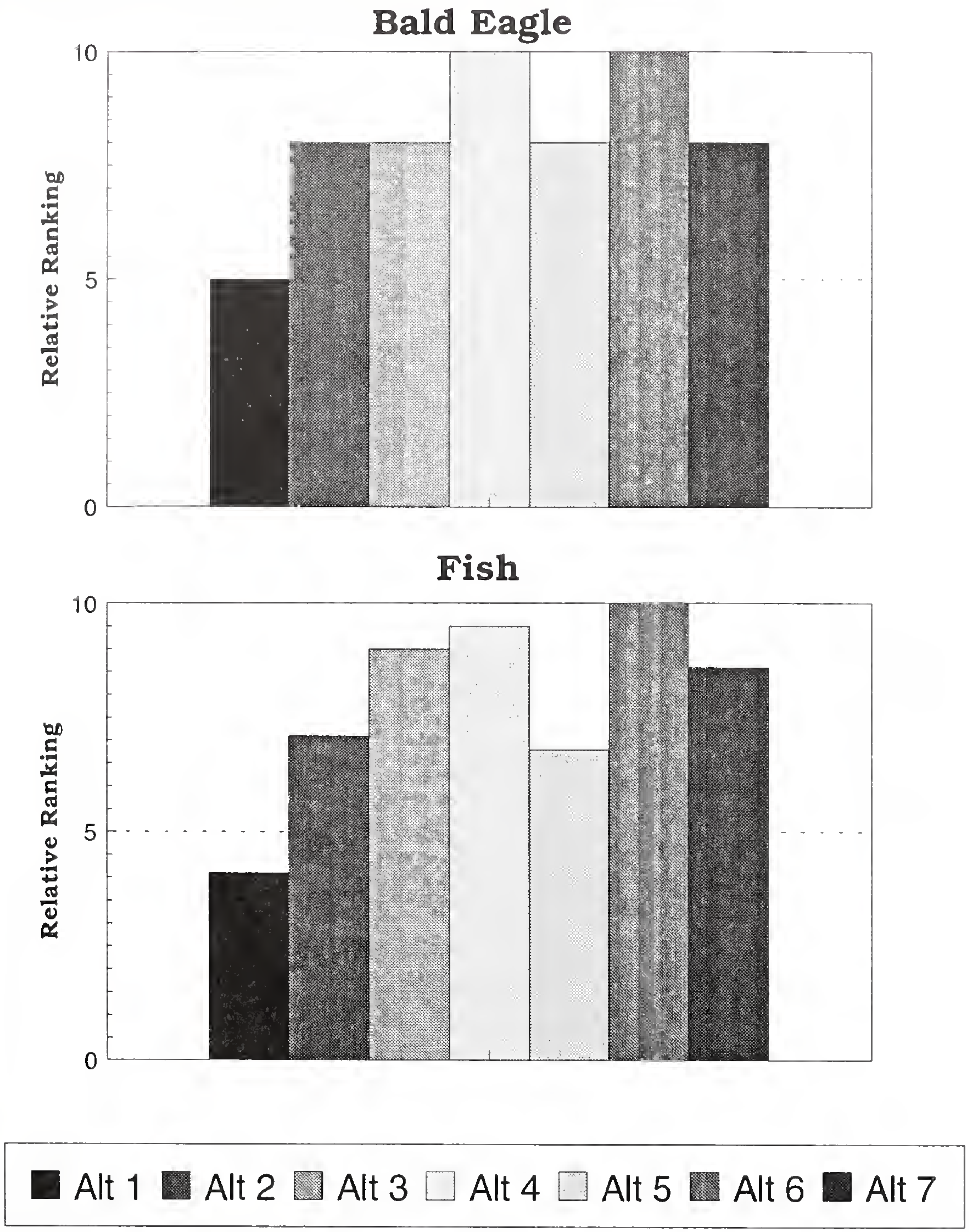
Snag/Downed Wood Dependent Species At-Risk: Long-term relative ranking of alternatives based on improved habitat outcomes for a selected group of species from Table 4-41 and snag and downed wood standards.

Species At-Risk Improved by Upland Restoration: Long-term relative ranking of alternatives based on improved habitat outcomes for a selected group of species from Table 4-41 and improvements in connectivity and reduction in fragmentation.

Species At-Risk Improved by Lower Road Density: Long-term relative ranking of alternatives based on improved habitat outcomes for a selected group of species from Table 4-41 activity tables, and road density standards.

Fewest Unfavorable Habitat Outcomes for Species At-Risk: Long-term relative ranking of alternatives based on the number of species with unfavorable outcomes from Table 4-41 excluding species at-risk historically.

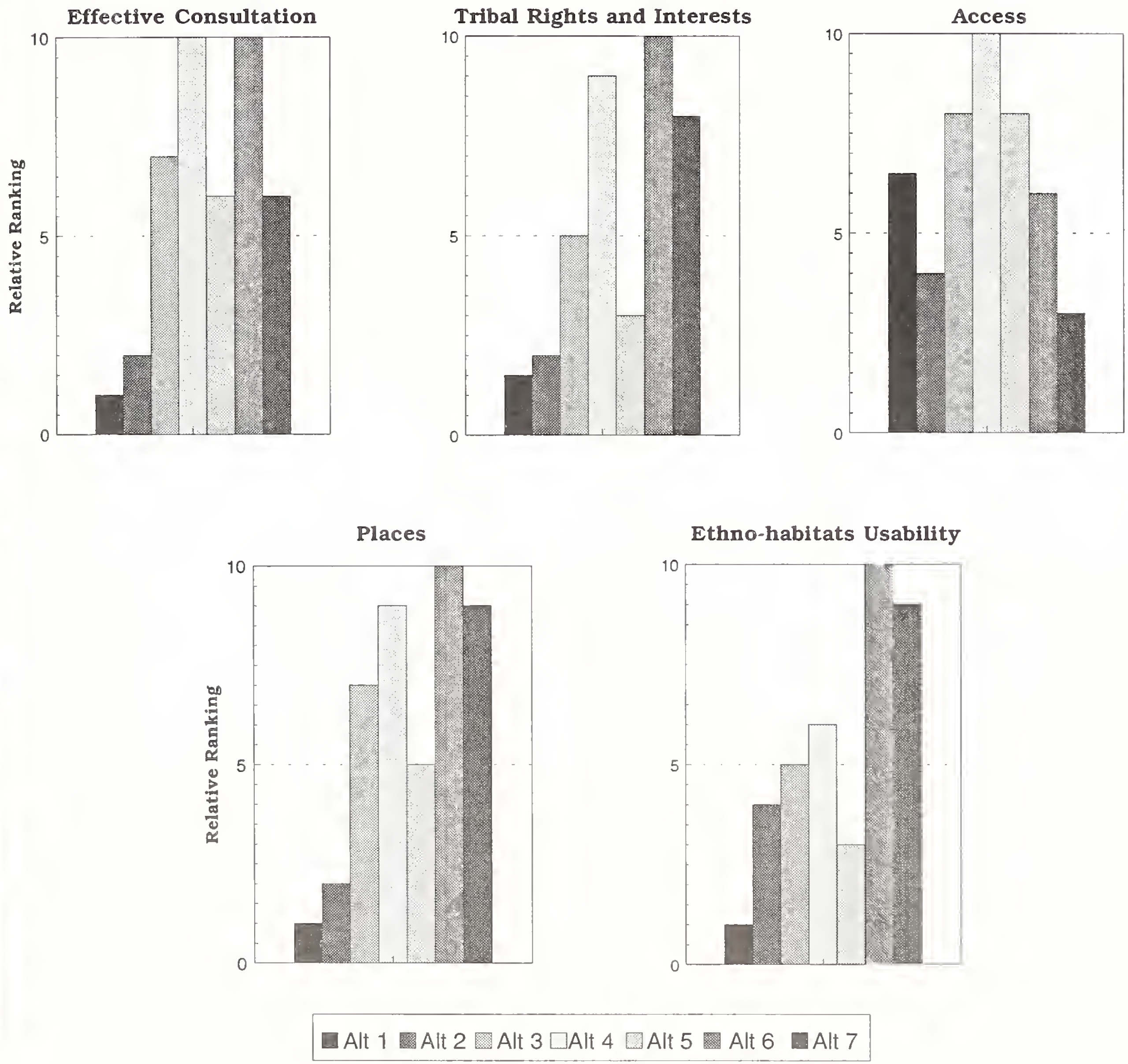
EC 6: How does each alternative contribute to long-term recovery and delisting of threatened and endangered species?



Bald Eagle: Likelihood of improvement of bald eagle habitat. (No other threatened or endangered terrestrial species exhibited a substantial difference between alternatives at this scale of analysis.) Long term relative ranking of alterantives based on habitat protection provided by the Endangered Species Act, riparian standards, and activity tables.

Fish: Long-term relative ranking of alternatives based on indicator variables from EC 3, and reflects improvement in habitat trends towards supporting viable populations of threatened and endangered fish species. Threatened Snake River ocean-type (fall) chinook are not included because the species is largely dependent on habitats outside of Forest Service- or BLM-administered lands.

EC 7: To what extent does each alternative respond to federal trust responsibilities and tribal rights and interests?



Effective Consultation: Relative ranking of alternatives reflects interagency/tribal consultation and tribal involvement based on consistency, involvement prior to decisions, the theme of the alternative, and objectives and standards.

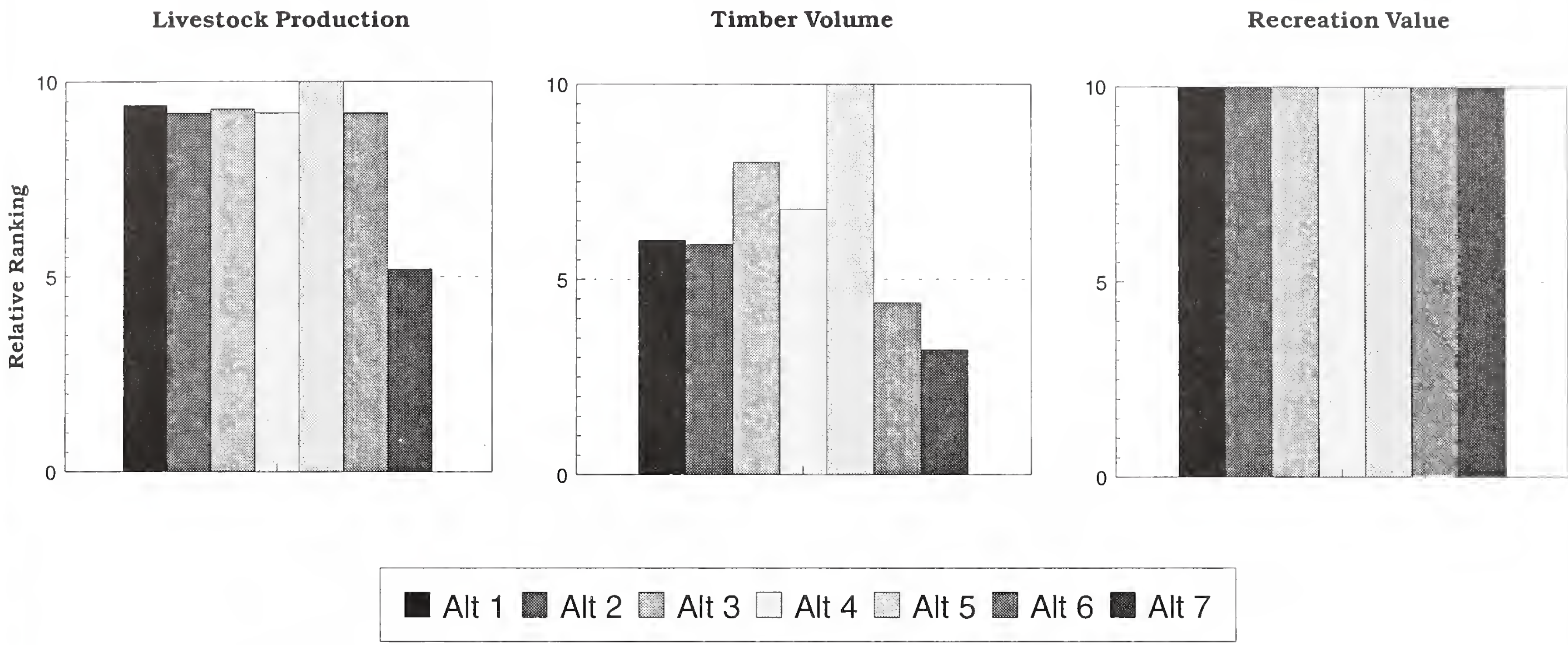
Tribal Rights and Interests: Relative ranking of alternatives based on the theme of the alternative, objectives and standards, the effectiveness of consultation, and related elements in Table 4-12.

Access: Relative ranking of alternatives based on the theme of the alternative, road management objectives and standards, and opportunity for tribes to take part in road management decisions.

Places: Relative ranking of alternatives reflects tribal significant places and their access/use based on the previous three indicator variables and Table 4-53.

Ethno-habitats Usability: Relative ranking of alternatives based on biophysical trends, tribal-interest species habitat trends, and the previous four indicator variables.

EC 8: What annual level of goods and services is provided by each alternative?

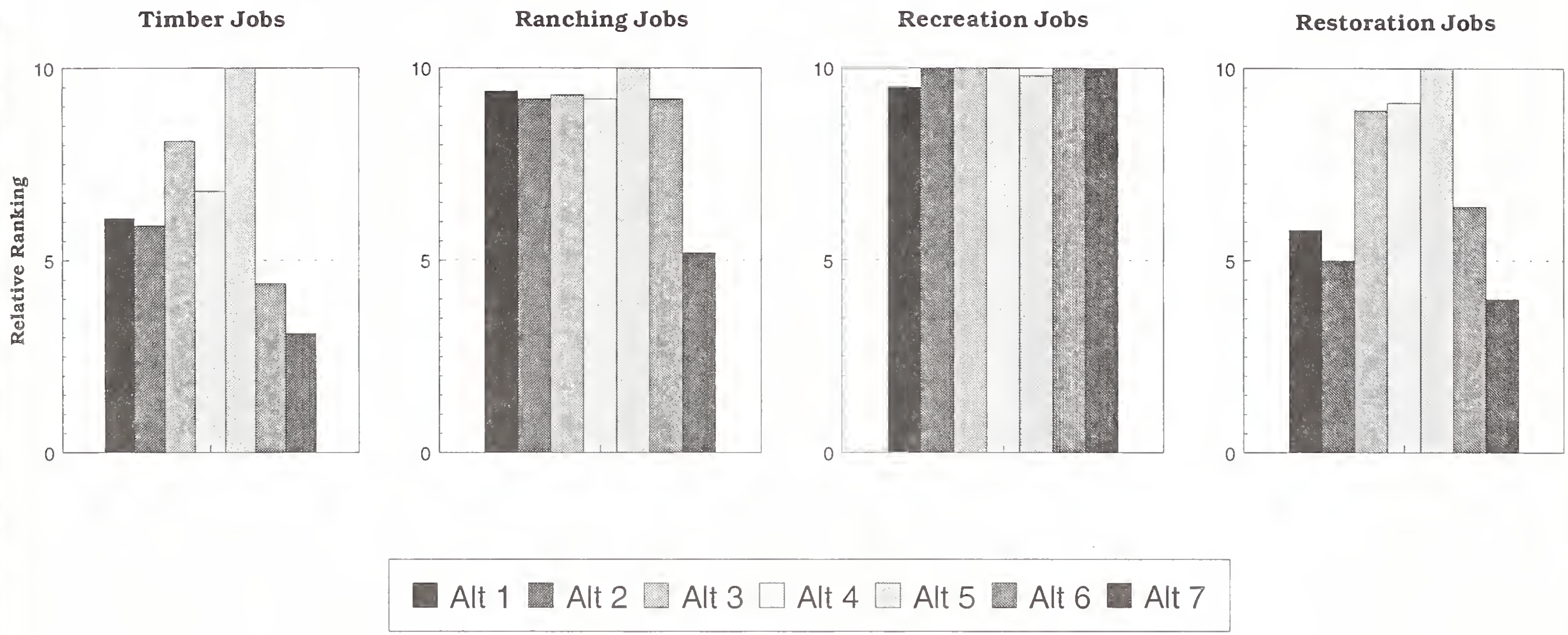


Livestock Production: Relative ranking of alternatives based on estimated percentage decrease from 1993 production level.

Timber Volume: Relative ranking of alternatives based on midpoint harvest acres from tables 3-6 and 3-7 multiplied times volume/acre values from simulations.

Recreation Value: Relative ranking of alternatives based on the Economics Chapter of the Scientific Assessment.

EC 9: What are the effects of each alternative on community vitality and resiliency?



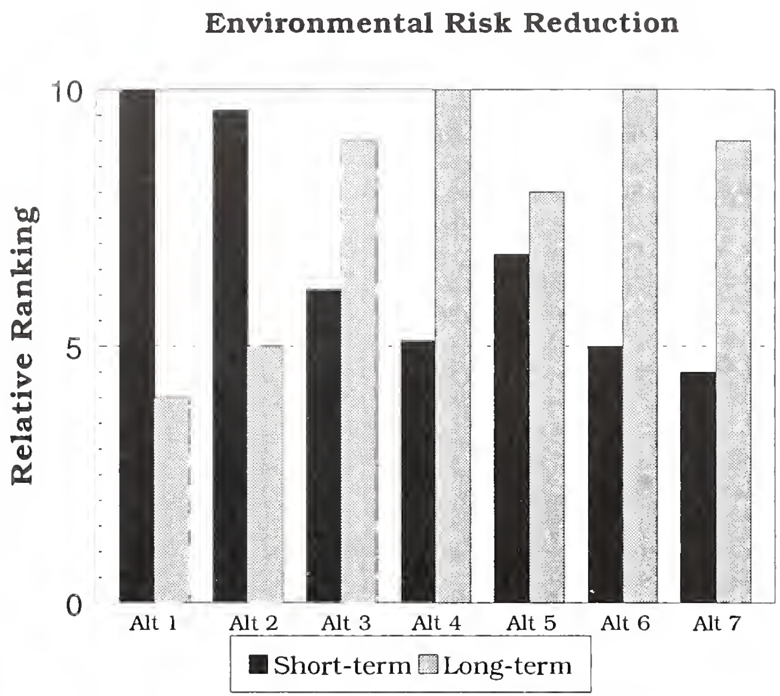
Timber Jobs: Relative ranking of alternatives derived from total volume harvested (mmbf) using a multiplier of jobs per mmbf.

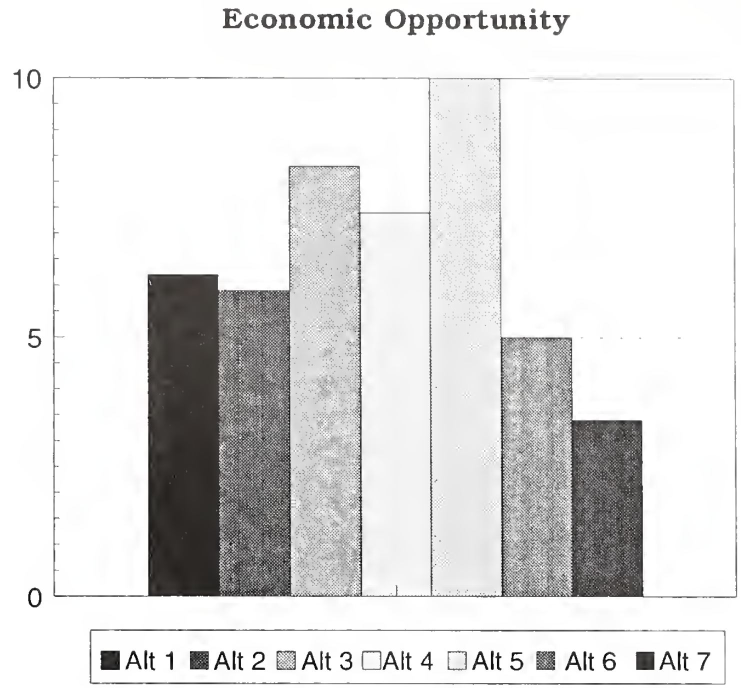
Ranching Jobs: Relative ranking of alternatives derived from total AUMs produced using a multiplier of jobs per AUM.

Recreation Jobs: Relative ranking of alternatives derived through an analysis of how a number of job sectors serve recreation.

Restoration Jobs: Relative ranking of alternatives derived by using a multiplier of jobs per million dollars spent based on activities in tables 3-6 and 3-7.

EC 10: What are the effects of each alternative on quality of life for project area residents?





Environmental Risk Reduction: Relative ranking of alternatives based on ecosystem analysis, range restoration, road closure, prescribed fire, timber harvest, and natural processes.

Economic Opportunity: Short-term relative ranking of alternative based on timber, ranching, and restoration jobs.

Effects on Forest Health and Natural Disturbance Processes

Alternative 4 would be the most responsive overall in addressing forest health, followed closely by Alternative 6. Alternatives 3 and 5 would be more responsive than Alternative 7, followed by Alternatives 2 and 1.

Indicator variables that describe forest health are the following: (1) stand structure and composition, (2)ecosystem processes and function, and (3) resilience to stress. Over time, fire exclusion, harvest, livestock grazing, road building, invasion of exotic species, ownership patterns, and other management practices have altered the landscape. The reduction of large trees, increases in mid-seral and multi-story forests, and increases in shade-tolerant tree species are changes in stand structure that have made these forests more vulnerable to fire, insects, disease, and climatic stresses. Many forests are out of balance with ecosystem processes, physical environment, and their locations on the landscape.

Alternative 4 would show the most aggressive restoration of ecosystem structure, process, function, and patterns. Alternative 6 would be slightly less aggressive because it puts more emphasis on adaptive management; this alternative would therefore also result in fewer risks from management activities. Alternative 7's passive approaches would lead to natural disturbances with more unpredictable results. Alternative 3 would fix only the high priority problems in forest health. Under Alternative 5, levels of restoration would vary depending on the priority area and on whether the focus is on commodity or amenity production. Alternatives 1 and 2 would continue many of the current trends in forest management.

Alternatives 4 and 6 would lead to forest structures and compositions in the long term resembling more historical conditions with more large trees, more shade-tolerant trees (ponderosa pine and western larch), older stands, more single story structures, and lower tree densities. In Alternatives 1, 2, and 5 (in timber priority areas), young forests would tend be relatively uniform in size and tree spacing with smaller patch sizes and fewer large trees compared to the other alternatives. Alternatives 1 and 2 would have more transitions from old to mid-seral and from single story to multi-story forest. Alternatives 3 and 7 (outside reserves) would have a combination of uniform and more historic conditions. Alternative 7 (inside reserves) may produce large patch sizes in the short term due to wildfire.

In Alternatives 4 and 6, the ecosystem would move most rapidly toward conditions similar to those under which soils and vegetation evolved. These alternatives have the highest likelihood of restoring ecosystem processes and function. Overall soil disturbance would be lowest, coarse woody debris would be highest, and road restoration and rehabilitation would be most aggressive. Hydrologic, carbon, and nutrient cycling would benefit in the process. Alternatives 3 and 5 have a somewhat lower likelihood of sustaining soil productivity and restoring and maintaining ecosystem processes. Alternative 7 is not rated as high because of the effects of severe wildfire and lack of road restoration in reserve areas. Alternatives 1 and 2 rank lowest for this variable.

Alternatives 3 through 6 are all projected to have fewer acres burned by wildfire and fewer acres of crown fire than Alternatives 1, 2, and 7 because they emphasize restoring forest structure to a state less susceptible to high intensity wildfire in the moist and dry forest. In the cold forest, management activities would reduce the extent of high intensity wildfires by patterning the landscape with varied age classes and forest structures. Alternatives 4 and 6 would produce disturbance patterns most in sync with the ecosystem's biological and physical environment. These alternatives would be followed by Alternatives 3, 5, 7, and 2, and 1. Alternatives 1 and 2 would continue to maintain landscapes of stand structures susceptible to high intensity wildfire. Alternative 7 (in reserves) is predicted to have the highest amounts of wildfire due to lack of restoration or fire suppression efforts in reserves.

Alternative 4 is projected to produce forested conditions most resistant to insect and disease epidemics such as lower densities and more shade-intolerant tree species. Alternative 3 would rank next, followed by Alternatives 6, 5, 7, and 1 and 2.

Effects on Rangeland Health and Natural Disturbance Processes

Alternatives were rated based on their relative ability to improve rangeland health and resemble or restore natural disturbance processes as compared with the other alternatives. Alternative 4 would be more responsive in improving rangeland health and natural disturbances than Alternatives 6, 7, and 3; Alternative 5 would be less responsive. These would all be more responsive than Alternatives 1 and 2. This comparison of alternatives takes into consideration the overall ability of alternatives to reverse undesirable conditions and trends described in the beginning of Chapter 2 called "Summary of Conditions and Trends." The ranking of alternatives may change as individual rangeland conditions and outcomes are examined. For example, Alternatives 3 and 4 would be most responsive in preventing the spread of noxious weeds, whereas Alternative 7 would have the highest ability to prevent negative affects to rangeland health caused by improper grazing of the plant resources. Natural disturbance processes or the resemblance thereof are predicted to improve overall under Alternatives 3 through 7 as ranked above.

Alternatives 4, 6, and 7 would have the highest likelihood of restoring, conserving, and maintaining soil productivity and function, sustainable through time. This is because overall soil disturbance would be lowest, and vegetation would aggressively move towards conditions most similar to those under which soils evolved while also providing the most reduction in spread of exotics. Alternative 7 may not be as effective in meeting goals for sustainable soil productivity and function as Alternative 4 and 6 because road restoration may not be directed at restoring soil and hydrologic function, and reducing the spread of exotics would have a less active approach. Alternatives 3 and 5 are somewhat less likely to meet the goals of sustainable soil productivity, but have a higher likelihood than alternatives 1 and 2.

Natural fire regimes, or the resemblance of these regimes in the dry grass and dry shrub potential vegetation groups, might not be desired in some areas in some alternatives because of the presence or conversion of native vegetation communities to altered sagebrush steppe. Fire in these communities can promote altered sagebrush steppe if exotic annual grasses like cheatgrass and medusahead are already present in the community or are in the vicinity. Fire, in this instance, would be of limited use in meeting the desired range of future conditions, described earlier in this chapter.

All alternatives are predicted to have less total wildfire acres burned than the historical levels, since no fire suppression existed in the historical period. Alternatives 1, 2, and 7 are predicted to have the highest amounts of wildfire. In Alternatives 1 and 2, this would appear to be a result of lower priorities for restoration of altered sagebrush steppe in the dry shrub PVG (the predicted levels of wildfire exceed the historical levels in this PVG). In Alternative 7, fire suppression actions within the large reserves would be limited to fires that threaten the reserve boundaries. But the amount of wildfire acres predicted is less than Alternative 1 and 2 for total rangeland PVG's as a result of suppression and restoration actions outside reserve boundaries. The dry shrub PVG in Alternative 7 would be predicted to be similar to historical levels, likely as result of no grazing or management action to reduce exotic annual grasses within reserves.

Alternatives 3 through 6 all are predicted to have fewer acres burned by wildfire than alternatives 1, 2, and 7. One primary reason for this difference is Alternatives 3 through 6 emphasize activities that would reduce the extent and break up the continuity of altered sage brush steppe. The result would be an enhanced ability to suppress wildfire in dry shrub areas. Alternatives 1 through 5 would not provide enough total fire (wildfire and prescribed fire) in cool shrub areas to reach historical levels of wildfire. These levels of disturbance would not likely achieve the levels of herbaceous-dominated stages which were historically in cool shrub. The levels of total fire in Alternative 6 would be similar to historical levels of wildfire, while total fire in Alternative 7 exceeds historical levels of wildfire.

All alternatives would show less wildfire in the dry grass area than historically, likely as a result of aggressive suppression in these areas. Even Alternative 7, the alternative with the

highest amount of wildfire, is predicted to have about one-half of the amount of wildfire as historically. This would likely be the result of effective suppression outside of reserve boundaries.

Effects on Aquatic and Riparian Health

Aquatic Health

The current composition, distribution, and status of most fish species within the planning area would improve under Alternatives 3, 4, 6, and 7, with the greatest potential for improvement occurring with Alternatives 4, 6, and 7. Alternative 4 may pose a higher risk in the short term than Alternatives 6 and 7 due to increased activities, but in the long term, Alternatives 4 and 6 have equally high potential for improvement, while that for Alternative 7 declines. All four provide better outcomes than Alternative 2. Most native fishes' distribution and status would continue to decline under Alternative 1 and Alternative 5 (outside aquatic, wildlife, and recreation priority areas).

Alternatives 6 and 7 would result in the greatest improved distribution and status of resident key salmonids in the short term (bull trout, westslope and Yellowstone cutthroat, and redband trout), while Alternatives 4 and 6 are equally high in the long term, while improvement declines with Alternative 7. Successful ecological outcomes of Alternatives 4 and 6 depend upon prioritization of restoration and other management actions and maximizing adaptive management to minimize risk.

Alternatives 3, 4, 6, and 7 would conserve most core population areas for steelhead and stream-type chinook salmon. Improvements in steelhead and stream-type chinook stocks under Alternative 4 are less certain in the short term due to the higher rate of restoration and other management, but the requirements of ecosystem analysis and setting of restoration priorities should reduce some of this uncertainty. However, none of the alternatives address the need for a comprehensive approach to restore habitat and alleviate mortality for steelhead and stream-type chinook stocks outside BLM- and Forest Service-administered lands. Alternatives 1, 2, and 5 would result in the continued decline in the overall status and distribution of steelhead and stream-type chinook salmon stocks.

None of the alternatives would be expected to provide for the full habitat needs of ocean-type chinook salmon, since none of the alternatives address the need for a comprehensive approach to restore habitat and alleviate mortality outside BLM- and Forest Service-administered lands. Alternatives 6 and 7 would provide the most conservative short-term approaches and might result in some benefits to ocean-type chinook salmon if management actions improve water quality and quantity. In the long term, Alternatives 4 and 6 would offer the greatest protection, because long-term risks of large-scale disturbances would increase for Alternative 7.

Implications. In Chapter 2, a sidebar discusses the effects of hydropower, hatcheries, harvest, and habitat on interior Columbia River Basin anadromous fishes.

- Downstream stresses associated with the hydropower system are dominant causes of declining anadromous fish runs in the Snake River, notwithstanding land use activities in the watersheds. Mid-Columbia anadromous stocks (e.g. John Day and Deschutes Rivers) are influenced less by hydropower due to a lower number of dams below spawning and rearing areas. Habitat degradation is another important factor in the decline of salmon and steelhead.
- Maintenance of high-quality habitats is vital to the persistence of populations but the magnitude of effects varies from sub-basin to sub-basin. High quality habitat alone is no guarantee of increased persistence without a comprehensive approach that addresses all mortality factors acting upon individual populations. Additional high quality habitat alone could increase abundance of individual fish but it would not likely reverse current negative population trends in the short-term. Assuming mainstem conditions are resolved in the longer term, and if the objective is to support the full expression of life histories ad species, then it will be necessary to conserve and restore broader habitat networks than currently exist.
- Salmon population numbers in much of the interior Columbia River Basin are far below what current habitat conditions could likely support under a scenario of increased downriver survival. Some areas (e.g. central Idaho and northern Cascades) potentially could support hundred-fold increase or better in adult numbers. However, this is not the case everywhere.

Existing habitat conditions in some areas, such as the John Day, Deschutes and Grande Ronde Rivers and Panther Creek, would likely not be sufficient to support increases in returning adults resulting from the improvement in downstream survival. In such places, there is a need to increase egg-to-smolt survival where it is currently depressed by habitat degradation.

Riparian Health

On a relative scale, Alternatives 6 and 7 are expected to provide the highest short-term benefits to riparian and aquatic environments because of riparian area protection requirements and reduced rates of management activities that could negatively affect these resources; however, over the long term Alternatives 4 and 6 offer equally high benefits. The lack of active watershed, rangeland, and forest restoration in Alternative 7 may pose risks to riparian and aquatic environments in the long term. Alternative 4 would have similar benefits to Alternatives 6 and 7, but it has a greater uncertainty of ecological outcomes in the short term due to higher amounts and rates of activities. Ecosystem analysis and prioritization of restoration required in Alternative 4 reduces some uncertainty associated with this alternative. Alternative 2 and 3 would benefit riparian and aquatic environments due to riparian area protection requirements but to lesser degrees than Alternatives 4, 6, and 7. Alternative 3 would provide slightly greater benefits than Alternative 2 due to an ecosystem management and watershed restoration emphasis. Alternatives 1 and 5 provide the least overall protection to riparian and aquatic environments. Alternative 1 is not expected to lead to recovery of aquatic and riparian environments because of a lack of a comprehensive riparian protection and recovery strategy. Although aquatic, wildlife, and recreation priority areas in Alternative 5 have the same level of protection as Alternatives 4 and 6, the lack of riparian protection outside these priority areas is expected to result in broad scale fragmentation of aquatic and riparian environments.

Effects on Landscape Health

The alternatives were rated based on "best fit" considerations: consistency of landscape patterns with their appropriate biophysical succession/disturbance regimes, associated reduction in soil disturbance and noxious weed invasion, conservation of landscape-scale terrestrial and riparian habitats, fire risk reduction in the urban-rural/wildland interface, and an associated flow of human commodities and amenities. When compared to the other alternatives, Alternative 4 would provide a much higher transition to healthy landscapes in the first decade. Alternative 3 would have a higher transition rate than Alternatives 5, 6, or 7, which would have higher rates than Alternatives 1 and 2. In the long term (50 to 100 years), Alternative 6 would have almost as high a transition rate as Alternative 4; Alternative 3 would have a somewhat more rapid transition than Alternatives 5 and 7, followed by Alternatives 2 and 1 in that order. Under projected cumulative effects, transition to landscape health would be somewhat diluted, but Alternatives 3 through 7 would promote landscape health across the interior Columbia River Basin. Alternatives 4 and 6 would rank highest, with Alternatives 3, 5, and 7 at a secondary level, and Alternatives 2 and 1 at respectively lower levels.

When considering the comparative costs of management, restoration, and wildfire suppression, Alternatives 4 and 3 would provide the highest return to landscape health for the cost within the first decade, followed by Alternatives 7, 6, and 5. Alternatives 1 and 2 would have the lowest first-decade return in improvement of landscape health for the cost. In the long term, Alternatives 4, 6, and 3 would be most efficient, while Alternatives 5 and 7 respectively would have lower return in improvement of landscape health for the cost. However, Alternatives 5 and 7 would transition only about half the landscapes toward a healthy condition, while Alternative 3 would transition almost two thirds, and Alternatives 4 and 6 would transition most landscapes toward a healthy condition. Alternatives 1 and 2 would have the poorest return for the cost and would transition very low amounts toward a healthy condition in the long term, but Alternative 2 would be somewhat higher than Alternative 1. In projected cumulative effects, Alternatives 4 and 6 would have the highest return in improved Basin-wide landscape health per unit of cost; Alternatives 3 and 7 would have somewhat lower returns; Alternatives 5 and 2 follow respectively; and Alternative 1 would have the poorest return per unit of cost.

Effects on Long-Term Viable Populations of Terrestrial Species

Historically, 18 plant and animal (vertebrate) species were judged to have viability outcomes of 4 or 5 (see Terrestrial Species Viability in Chapter 4 for explanation of outcomes). Currently, 51 species also have viability outcomes of 4 or 5. There would be little change in overall habitat outcomes for the vast majority of species analyzed for all alternatives. Implementation of Alternatives 4, 6, and 7 would result in 32, 32, and 33 species respectively; Alternatives 5, 3, 2, and 1 would result in 37, 38, 39, and 46 species with unfavorable habitat outcomes.

Alternative 1 would result in the highest number of species with some risk of extirpation, on average, than the other alternatives. Alternatives 1, 2, and 5 would result in more species with increased risk of extirpation/viability loss than with improved likelihood of persistence and viability; however, Alternative 2 also has the greatest number of species showing no change in habitat outcomes. Alternatives 3 and 7 would result in an equal number of species with increased risks of extirpation and species with improved likelihood of persistence. Alternatives 4 and 6 would result in more species with improved likelihood of persistence than species with increased risk of extirpation. None of the alternatives approach historical conditions for habitats or viable populations for the 118 vertebrate and 14 plant species analyzed. Many species, including listed species, are influenced by factors beyond the ability of BLM or Forest Service managers to control, such as species migration and off-site habitat conversion.

Effects on Long-term Recovery and Delisting of Threatened and Endangered Species

There are 28 federally listed threatened or endangered, or candidate species in the project area, including plants, vertebrates, and invertebrates. The Science Team considered 7 of these 28 to warrant further broad-scale analysis; others had limited ranges and are more appropriately addressed locally through forest or resource area plans or project plans. Historically, 4 of these species ~ woodland caribou, *Howellia aquatilis*, MacFarlane's four-o'clock, and Malheur wire-lettuce ~ were disjunct and isolated. This suggests that these species' habitats are of concern within the project area.

The other three threatened or endangered species that were evaluated have varying outcomes. Bald eagle habitat would improve in all alternatives, with greatest improvement seen in Alternatives 4 and 6. Gray wolves will have a high likelihood of viability on BLM- and Forest Service-administered lands, with the best outcome in Alternative 7. Grizzly bear habitat is greatly reduced from historical levels, and habitat outcomes are poor in all alternatives with Alternativc 7 showing a slight improvement, because of large reserves. Both wolves and grizzly bears have a high likelihood of cxtirpation when cumulative effects are considered.

Threatened and endangered species were evaluated for how the species would be affected by the alternatives, but were not evaluated regarding delisting and recovery. See the outcomes discussed in the Effects on Long-term Terrestrial Species Viability section below, which also apply to threatened and endangered species viability.

The largest improvement in condition for narrow endemic threatened and endangered fishes is associated with Alternative 6. Alternative 4 is similar to Alternative 6, but it carries a slightly higher risk in the short term. Alternative 7 would conserve core populations, but depressed populations in currently degraded habitats outside of reserves may continue to decline over the long term. Similarly, Alternative 3 would conserve most core populations, but may not prevent declines in areas in need of aggressive restoration in the long term. Listed anadromous fish species, except Snake River ocean-type chinook, show the same results, but persistence of these species is dependent upon a comprehensive approach to address and alleviate sources of mortality occurring outside of Forest Service- or BLM- administered lands. None of the alternatives are expected to provide for the habitat needs of listed Snake River ocean-type chinook salmon because they inhabit lower elevation, non-federally administered mainstem river habitats and are less affected by BLM or Forest Service management. Alternatives 6 and 7 have the most conservative approach and might result in some benefit to Snake River ocean-type chinook salmon if management actions improve water

quality and quantity. None of the alternatives address the need for a comprehensive approach to restore habitat and alleviate mortality outside BLM- or Forest Service-administered lands to ensure persistence of ocean-type chinook salmon stocks, because it is beyond the scope of this EIS.

Effects on Federal Trust Responsibilities and Tribal Rights and Interests

Every alternative has some amount of activity on agency lands, which are potentially disturbing to ecosystems, habitats (including ethno-habitats), resources, places, and heritage resources where American Indians/tribes have interests and/or reserved rights. In the long term, Alternatives 1, 2, and 5 would have a low ability and Alternatives 3 and 7 a moderate ability to achieve healthy landscape systems through management activities. Alternatives 4 and 6 would have a high rate of transition toward healthy landscapes in resembling natural disturbance patterns. Given tribes' interest in management actions that can stop and reverse trends that are moving away from the historical range of conditions and facilitate moving toward the desired range of future conditions, Alternatives 4 and 6 would be favorable to their interests.

The alternatives have varying effects on different tribes and Indian communities. Generally, Alternatives 1 and 2 were the least responsive in providing for meaningful consultation/access to decision making, moving towards the desired range of future conditions, protection of culturally significant fish and wildlife species and their habitats with viability concerns, recognition or management of places, providing for access rights, and addressing interests or rights to healthy, sustainable or useable ethno-habitats. Alternative 5 also provides a relatively moderate response, but allows for more meaningful consultation and is slightly more responsive to Indian interests/rights than Alternatives 1 and 2. Relative to Alternatives 1, 2 and 5, Alternatives 3 and 7 responded better, especially with regards to access to decision-making, aquatic protection and restoration, and providing more favorable trends in habitat and landscape dynamics. Overall, Alternatives 4 and 6 are expected to be most responsive to Federal trust responsibility and tribal rights and interests. Although they do not provide all of the most protective measures, they tend to exhibit the most positive trends toward ecosystem functions and processes, habitat, watershed restoration, and access to effective consultation.

No alternative is fully responsive to all interests of tribes in the project area. All alternatives reflect a recognition for baseline Federal legal responsibilities. Several alternatives support enhancement of habitats for species with treaty significance or of interest to tribes.

Effects on the Level of Annual Goods and Services

While 'goods and services' includes a large array of benefits provided from Forest Service- and BLM-administered lands, both priced and unpriced, the effects on three major outputs are evaluated for the alternatives. These include: livestock animal unit months (AUMs), representing the number of domestic livestock fed on Forest Service- and BLM-administered rangelands; the supply of recreation provided by each of three recreation opportunity spectrum (ROS) classes; and wood volume produced from timber harvest and vegetation management actions, measured in billion board feet (bbf). Alternative 5 produces the most AUMs, but only slightly more than Alternatives 1, 2, 3, 4 and 6. Alternative 7 produces about half the AUMs of the other alternatives. All the alternatives supply about the same amount of recreation value. There are some changes in the types of recreation opportunities provided. Alternative 7 would cause a shift from developed and road-based recreation to semi-primitive recreation in the reserves. Alternative 3 through 7 potentially provide less water-based and dispersed roaded recreation than Alternatives 1 and 2. Alternatives 1 and 5 harvest the most wood volume. Compared to Alternatives 1 and 5, Alternatives 2, 3, 4, 6 and 7 harvest about 40, 20, 30, 55 and 70 percent less wood respectively.

The alternatives produce many other goods and services for people that cannot be reliably measured, specifically those benefits produced through maintaining or restoring ecosystem conditions, processes, and disturbance regimes. The management strategies for Alternatives 3, 4 and 6 emphasize restoration with an intent to supply ecosystem benefits. Alternative 4 does the most restoration. Alternatives 3 and 6 do about 20 percent less than Alternative 4. Alternative 5, which emphasizes a mix of production and restoration, does about 40

percent less restoration than Alternative 4. Alternatives 1, 2 and 7 do about 50 to 60 percent less restoration than Alternative 4, though each emphasizes different types. Alternative 7 includes a substantial amount of passive restoration (through the reserves), an emphasis not shared by the other alternatives. Benefits expected from restoration activities include improved environmental goods and services and reduced environmental risk. Both kinds of benefits are important quality-of-life attributes for people residing inside and outside the project area.

Effects on Community Vitality and Resiliency

Community vitality and resiliency are influenced by many factors outside the scope of Forest Service and BLM land use decisions. The factor most directly influenced by the agencies is the number, type and location of jobs generated. Job effects are most influenced by the amount and type of management activity done, outputs produced, and services provided from Forest Service and BLM-administered lands. Most important are jobs generated from grazing livestock, supplying recreation, harvesting and processing timber, and jobs related to conducting restoration activties. Alternative 5 generates the most ranching jobs, though ranching jobs under Alternatives 1, 2, 3, 4, and 6 drop by less than 10 percent compared to Alternative 5. Ranching jobs under Alternative 7 drop by about 50 percent compared to Alternative 5. All seven alternatives provide about the same number of recreation jobs. Alternative 5 generates the most jobs from harvesting and processing timber. Compared to Alternatives 5, Alternatives 1, 2, 3, 4, 6 and 7 generate about 40, 40, 20, 30, 55 and 70 percent fewer timber jobs, respectively. Alternative 5 generates the most jobs through management activities. Compared to Alternative 5, Alternatives 1, 2, 3, 4, 6 and 7 generate about 40, 50, 10, 10, 35 and 60 percent fewer restoration jobs, respectively.

The locations where jobs will be generated cannot be reliably estimated. Alternatives 3 through 7 share an objective to support the economic needs of areas determined to be economically and socially vulnerable to changing Forest Service and BLM management. Concentrating jobs from restoration activities and resource production in these areas could accomplish this objective, though other strategies for economic assistance may also be employed. Alternatives 3, 4, and 6 share an emphasis to reduce the risk of fire at the wildland-urban interface, presumably concentrating a larger proportion of restoration jobs in these areas. Alternative 5 specifies that timber, livestock grazing, and recreation will be emphasized in certain areas. Presumably, jobs would follow these prioritized uses. How management priorities distribute activities, outputs, and services from Forest Service and BLM-administered lands to different areas can be important to the quality-of-life of people in those areas because of the economic opportunities they provide.

Effects on Quality of Life for Project Area Residents

Like economic vitality and resiliency, the quality of life for project area residents is influenced by many factors outside the scope of Forest Service and BLM land use decisions. Furthermore, individuals will prioritize the factors that define their quality of life quite differently. For some, their economic well-being may be paramount. In some areas, that economic well-being may be closely associated with jobs generated from the use of Forest Service and BLM-administered lands. Quality-of-life may also depend on the ability of county governments to provide needed social and economic services. Some counties depend on revenues from agency lands to finance these services. This situation is often found in geographically isolated and sparsely populated parts of the project area. For others, whose economic well-being is not directly tied to agency lands, lifestyle considerations and environmental concerns may be paramount is appraising their quality of life. For these people, the ecological benefits and environmental risks associated with Forest Service and BLM-administered lands are most important. This situation is often found in more densely populated and economically diverse areas, and rural communities experiencing rapid population growth. Translating these two situations into 'economic opportunity' and 'environmental risk' factors provides a means to evaluate the effects of the Draft EIS alternatives on the quality of life of project area residents.

Alternative 5 provides the most jobs and presumably the most economic opportunity.

Compared to Alternative 5, Alternatives 1, 2, 3, 4, 6 and 7 provide about 40, 40, 25, 25, 50 and 65 percent fewer jobs, respectively. The proportion of these jobs that will benefit the isolated and sparsely populated rural areas, where they are most needed, is unknown. It may be that the restoration themes of Alternatives 3, 4, 6 and 7 result in a moderately smaller proportion of jobs going to rural areas (due to more emphasis on fire risk reduction at the more populated wildland-urban interface areas) and that timber priority areas in Alternative 5 might favor rural areas.

A composite measure for environmental risk that accounts for the benefits and risks associated with ecosystem analysis, restoration activities, timber harvest, and natural processes is used to evaluate this aspect of quality of life for the seven alternatives; for both the long and short term. In the short term, Alternatives 4, 6 and 7 appear to involve the most environmental risk, though Alternatives 3 and 5 involve almost as much. The difference in short-term risk among Alternatives 3, 4, 5, 6 and 7 is probably not significant for this composite measure. Short-term risk for Alternatives 1 and 2 is about 35 percent less than for Alternatives 4, 6 and 7. In the long term, Alternative 1 appears to involve the greatest environmental risk, followed closely by Alternative 2. Alternatives 3 through 7 involve about 40 to 60 percent less long-term risk than Alternative 1. This composite measure of environmental risk leads to the conclusion that: short-term environmental risk is relatively high (and similar) for Alternatives 3 through 7; long-term risk is considerably lower than the short-term risk for Alternatives 3 through 7; and long-term risk is considerably higher than short term risk for Alternatives 1 and 2.

A User's Guide to the "Action" Alternatives

As noted above under Development of Alternatives, each "action" alternative (that is, Alternatives 3–7) was formulated through a multi-step process. Generally, this process was designed so that each alternative could be formulated in enough detail to provide for meaningful comprehension, comparison, and analysis of the alternatives. This user's guide includes questions and answers commonly raised about the alternatives.

Rangelands

✓ **I graze livestock on Federal land south of Murphy, Idaho. How can I interpret Alternative 4 for this area?**

To interpret Alternative 4 for Federal land south of Murphy, use the steps described and illustrated below:

1. Murphy is located in southwest Idaho. Refer to Map 2-34, Range Clusters, to determine what range cluster encompasses Federal land south of Murphy. *(Federal land south of Murphy lies mostly within range cluster 5.)*

2. Turn to the Description of Alternatives section in this chapter to determine the overall focus of Alternative 4. *(Alternative 4 is designed to aggressively restore ecosystem health through active management, the results of which resemble endemic disturbance processes including insects, disease, and fire. The alternative focuses on short-term vegetation management to improve the likelihood of moving towards or maintaining ecosystem processes that function properly in the long-term.)*

3. Turn to table 3-10, Comparison of Alternatives by Management Emphases, to determine the management emphasis assigned to range cluster 5 under Alternative 4. **(Please turn to the first page of the Objectives and Standards section of this Chapter for the definitions of the management emphasis terms *Produce, Restore,* and *Conserve.*)**

As shown below in the range cluster portion of table 3-10, the **Restore** management emphasis is assigned to range cluster 5 under Alternative 4:

	Alternatives						
Range Clusters	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1	P	PC	RP	R	RP	R	CR
2	C	C	C	CR	C	CR	C
3	PC	C	CR	R	CR	CR	C
4	P	PC	RP	R	PC	R	CR
5	P	PC	R	**R**	PC	CR	C
6	P	PC	RP	R	RP	R	CR

4. Turn to Appendix L to determine the rule for assigning levels of management activities to a Restore management emphasis for range clusters.

As shown below in the rangeland portion of Appendix L, a Restore management emphasis for range clusters means moderate or high levels of livestock management, with three or more restoration activities at moderate or higher levels:

	Rule Set	
Management Emphasis	Livestock Management	Restoration Activities
C	High	1 or less restoration activity > or = Mod
C-R	High	2 restoration activities > or = Mod
R	**Mod or High**	**3 or more restoration activities > or = Mod**
R-P	Low or Mod	2 restoration activities > or = Mod
P	Low	1 or less restoration activity > or = Mod
P-C	Mod	1 or less restoration activity > or = Mod

5. Refer to table 3-11, Comparison of Alternatives by Management Activity and Cluster, to determine how the rules described in Appendix L were applied to range cluster 5 under Alternative 4.

As shown in this excerpt from table 3-11, a Restore management emphasis for range cluster 5 under Alternative 4 calls for high levels of livestock management with moderate levels of range improvement, a low decrease in road density, moderate levels of riparian restoration, and prescribed burning. (Prescribed fire planning is not regarded as a restoration activity.)

	Alternatives						
Management Activity	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Range Cluster 5							
Livestock Management	L	M	M	**H**	M	H	H
Improve Rangeland	L	L	M	**M**	L	L	L
Decrease Road Density	L	L	L	**L**	L	L	L
Riparian Restoration	L	L	M	**M**	M	M	L
Prescribed Burning	L	L	M	**M**	L	M	M
Prescribed Fire Plan	L	L	L	**M**	L	M	H

6. Turn to table 3-12, Cluster Activity Level Assumptions for All Action Alternatives, to interpret what the high, moderate, and low activity levels mean.

This excerpt from table 3-12 shows the activity levels assumed to be applied within the first decade in range cluster 5 under Alternative 4:

Rangelands	Low	Moderate	High
Livestock Management (Percent of all rangeland with improved management)	0-6	6-12	**12-20**
Improve Rangelands (Percent of all rangeland treated/decade)	0-4	**4-8**	8-11
Decrease Road Density (Percent of native surface road miles reduced/decade)	**0-25**	25-50	50+
Riparian Restoration (Percent of all riparian areas treated/decade)	0-25	**25-50**	50-75
Prescribed Burning (Percent of all rangeland treated/decade)	0-3	**3-6**	6-9
Prescribed Fire Plans (Percent of all rangeland with implemented plans/decade)	0-20	**20-40**	40+

Livestock Management. A summation of livestock management variables that affect rangeland health, including: grazing systems, changing riparian grazing management, season of use (length and timing), number of head, change of class, distribution, grazing deferment, and herding.

Improve Rangelands. Capital Investments: fencing, stock water improvements, seedings, control of invasion or spread of exotics, and non-fire shrub and juniper control.

Decrease Road Density. Permanent closure of native surface roads.

Riparian Restoration. Includes improving road condition (drainage and/or surface), riparian plantings, in-channel restoration, and riparian exclosures.

Prescribed Burning. Management ignited fire.

Prescribed Fire Plan. Allows natural ignition fires to burn when in prescription and/or identifies areas that require prescribed burning.

What this means for the first decade on BLM-administered land in Range Cluster 5:

- 12 to 20 percent of rangeland would have improved management [high level of livestock management].
- 4 to 8 percent of rangeland would be treated [moderate level of rangeland improvement].
- 0 to 25 percent of net total native surface road miles would be permanently closed [low decrease in road density].
- 25 to 50 percent of riparian areas would be treated [moderate level of riparian restoration].
- 3 to 6 percent of rangeland would be prescribed burned through management ignition [moderate level of prescribed burning].
- On 20 to 40 percent of rangeland, naturally-ignited fires would be allowed to burn when in prescription, and/or areas that need prescribed fire would be identified [moderate level of prescribed fire plan].

7. Refer to table 3-13, Summary of Activity Levels Matched with Relevant Objectives, Alternative 4, to determine the objectives that are relevant to the various activity groups.

As shown in this excerpt from table 3-13, several objectives are relevant to the activities undertaken on Federal lands in range cluster 5 under Alternative 4, including Objective TS-O15. Table 3-13 in its entirety follows this User's Guide.

		Range Clusters					
		1 R	2 CR	3 R	4 R	5 R	6 R
Livestock Management	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,3,4,12,13,14,15; AQ-O1,2,3,4,5,6,7,910,11,12,13,14; HA-O2,3,4,5,6,7; HU-O1,3,4,5,6,7; RM-O2; AM-O1,2	M	H	H	**M**	H	H
Improve rangeland	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,2,3,4,5,12,13,1415; AQ-O1,2,3,4,5,6,7,9,10,11,12,13,14; HA-O1,2,3,4,5,6; HU-O3,4,7,14; RM-O2; AM-O1,2	M	L	M	**M**	M	H
Decrease road density	EM-O1,2,3; PE-O1,2,3,4; TS-O1,4,12,15; AQ-O1,2,3,4,5,6,7,9,10,12,13,14; HA-O2,3,4,5,6; HU-O2,3,4,13,14; RM-O2,3; AM-O1,2	H	L	M	**M**	L	M
Riparian restoration	EM-O1,2,3; PE-O1,2,3,4; TS-O1,3,4,5,12,14,15; AQ-O1,2,3,4,5,6,7,9,10,11,12,13,14; HA-O1,2,3,4,5,6; HU-O3,4,7; RM-O1,2,3,4; AM-O1,2	M	M	M	**M**	M	M
Prescribed burning	EM-O1,2,3,4; PE-O1,2,3,4,5; TS-O1,2,3,4,12,15; AQ-O1,2,3,4,5,6,7,9,10,12,13; HA-O1,2,5,6; HU-O3,4,9; RM-O2; AM-O1,2	H	H	H	**M**	M	L
Prescribed fire plans	EM-O1,2,3,4; PE-O1,2,3,4,5; TS-O1,2,12,15; AQ-O1,2,3,4,5,6,7,9,10,12,13,14; HA-O2,3,4,5,6; HU-O3,4,9; RM-O2; AM-O1,2	H	H	H	**M**	M	L
Recreation activities	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,4,12; AQ-O1,2,3,4,7,9,12,13; HA-O4,5,6; HU-O1,3,4,7,8,10,11,12; RM-O1,2,3,4; AM-O1,2	—	—	—	—	—	—

8. Turn to table 3-5, Objectives and Standards, to find the objectives and standards, including Objective Ts-O15. This excerpt from the table includes the following description of Objective Ts-O15, under Alternative 4.

Table 3-5 Objectives and Standards	
TS-O15.	Objective: Restore dry grasslands, dry shrublands, and cool shrublands in Range Clusers 1, 5, and 6.

9. Turn to table 3-7, Management Activities on UCRB Rangeland, to find the level of activity for the first decade in Alternative 4 range cluster 5. *(We see that improved livestock management would be developed for 1,405,000–1,915,000 acres; range improvement techniques would be applied to 520,000–695,000 acres; prescribed burning would be applied to 390,000–505,000 acres; and riparian restoration actions would be taken on 70,000–100,000 acres of Federal rangeland. There would be 0 to 25 percent decrease in native surface road.)*

	ACRES (thousands per decade)													
Range Cluster	Livestock Management				Improve Rangelands				Prescribed Burning				Riparian Restr.	Roads Decrs.(%)
	dry grass	dry shrub	cool shrub	**Total**	dry grass	dry shrub	cool shrub	**Total**	dry grass	dry shrub	cool shrub	**Total**		
1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	0	5-10	0	5-10	0	0	0	0	0	0	0-5	0-5	0	0-25
3	0	5-10	0	5-10	0	0-5	0	0-5	0	0	0-5	0-5	0	25-50
4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5	210-285	1055-1435	140-195	**1405-1915**	80-105	390-520	50-70	**520-695**	65-85	25-35	300-385	**390-505**	**70-100**	**0-25**
6	120-160	595-790	80-105	795-1055	70-95	350-485	50-60	470-640	10-20	5-10	60-80	75-110	30-40	25-50
Total	330-445	1660-2245	220-300	2210-2990	150-200	740-1010	100-130	990-1340	75-105	30-45	360-475	465-625	100-140	

In summary, under Alternative 4, Federal land south of Murphy, Idaho, would generally be managed with a Restore emphasis, with high levels of improved livestock management, moderate levels of rangeland improvement activities, riparian restoration activities, and prescribed burning, and a low level of decreasing road density.

Forestlands

✓ ***My family backpacks near Libby, Montana. How can I interpret Alternative 4 for this area?***

To interpret Alternative 4 for Federal land near Libby, use the steps described and illustrated below:

1. Libby is located in northwest Montana. Refer to Figure 2-33, Forest Clusters, to determine what forest cluster encompasses Federal land near Libby. *(Federal land near Libby lies within forest cluster* 4.)

2. Turn to the Description of Alternatives section in this chapter to determine the overall focus of Alternative 4. *(Alternative 4 is designed to aggressively restore ecosystem health through active management, the results of which resemble endemic disturbance processes including insects, disease, and fire. The alternative focuses on short-term vegetation management to improve the likelihood of moving towards or maintaining ecosystem processes that function properly in the long term.)*

3. Turn to table 3-10, Comparison of Alternatives by Management Emphases, to determine the management emphasis assigned to forest cluster 4 under Alternative 4.

As shown below in the forest cluster portion of table 3-10, the **Restore** management emphasis is assigned to forest cluster 4 under Alternative 4:

	Alternatives						
Forest Clusters	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1	C	C	CR	CR	C	CR	C
2	PC	C	R	R	CR	R	C
3	P	PC	R	R	R	R	CR
4	P	PC	RP	**R**	P	R	CR
5	P	CR	R	R	R	R	CR
6	PC	C	CR	R	RP	CR	C

4. Turn to Appendix L to determine the rule for assigning levels of management activities to a Restore management emphasis for forest clusters.

As shown below in this excerpt from Appendix L, a Restore management emphasis for forest clusters means low or moderate levels of timber harvest, with three or more restoration activities at moderate or greater levels.

	Rule Set	
Management Emphasis	Harvest	Restoration Activities
C	Low	1 or less restoration activity > or = Mod
C-R	Low	2 restoration activities > or = Mod
R	**Low or Mod**	**3 or more restoration activities > or = Mod**
R-P	Mod or High	2 restoration activities > or = Mod
P	High	1 or less restoration activity > or = Mod
P-C	Mod	1 or less restoration activity > or = Mod

5. Refer to table 3-11, Comparison of Alternatives by Management Activity and Cluster, to determine how the rules described in Appendix L were applied to forest cluster 4 under Alternative 4.

As shown in the forest cluster portion of table 3-11, a Restore management emphasis for forest cluster 4 under Alternative 4 calls for a moderate level of timber harvest, high level of thinning, moderate levels of decreased road density,watershed restoration, and prescribed burning. (Prescribed fire planning is not regarded as a restoration activity.)

	Alternatives						
Management Activity	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Forest Cluster 4							
Harvest	H	M	M	**M**	H	M	L
Thin	M	M	H	**H**	H	H	L
Decrease Road Density	L	L	M	**M**	L	M	M
Watershed Restoration	L	L	L	**M**	L	M	L
Prescribed Burning	L	L	L	**M**	L	M	M
Prescribed Fire Plan	L	L	L	**M**	L	M	M

6. Turn to table 3-12, Cluster Activity Level Assumptions for All Action Alternatives, to interpret what the high and moderate activity levels mean.

This excerpt from table 3-12 shows the activity levels assumed to occur within the first decade in forest cluster 4 under Alternative 4:

Forest		Low	Moderate	High
Harvest (commercial)	Alts. 1, 2, 7 >	0-4	4-8	8-10
(Percent of all forested area treated/decade)	Alts. 3 to 6 >	0-5	**5-9**	9-11
Thin (pre-commercial) (Percent of all forested area treated/decade)		0-3	3-6	**6-8**
Decrease Road Density (Percent of native surface road miles reduced/decade)		0-25	**25-50**	50+
Watershed Restoration (Percent of all forested area treated/decade)		0-3	**3-6**	6-8
Prescribed Burning (Percent of all forested area treated/decade)		0-5	**5-9**	9-11
Prescribed Fire Plans (Percent of all forestland with implemented plans/decade)		0-20	**20-40**	40+

Harvest. All commercial harvest methods (for example single tree selection, group selection, shelterwood, seed tree, overstory removal, clearcut, and commercial thinning from above or below)

Thin. All pre-commercial thinnings used to alter forest structure, species composition, density, rate of growth, fuel ladders, fire behavior, etc.

Watershed Restoration. Includes increased road maintenance, improved road condition (surface and/or drainage), reduced road related erosion, road obliteration, road decommissioning, increased large woody material, riparian plantings, in-channel restoration, etc.

Decrease Road Density. Permanent closure of native surface roads.

Riparian Restoration. Includes improving road condition (drainage and/or surface), riparian plantings, in-channel restoration, and riparian exclosures.

Prescribed Burning. Management ignited fire.

Prescribed Fire Plan. Allows natural ignition fires to burn when in prescription and/or identifies areas that require prescribed burning.

What this means for the first decade, under Alternative 4, in Forest Cluster 4 on Forest Service-administered lands:

- 5 to 9 percent of forestlands within the cluster would be treated through timber harvest [moderate level of timber harvest].
- 6 to 8 percent of forested area would be pre-commercially thinned [high level of thinning].
- There would be a 25 to 50 percent net reduction in native surface road miles on Federal lands [moderate decrease in road density].
- 3 to 6 percent of forested area would be treated through watershed restoration projects, such as increased road maintenance or riparian plantings [moderate level of prescribed burning].
- 5 to 9 percent of forested area would be prescribed burned through management ignition [moderate level of prescribed burning].
- On 20 to 40 percent of forested land, naturally-ignited fires would be allowed to burn when in prescription, and/or areas that needed prescribed fire would be identified [moderate level of prescribed fire plan].

7. Refer to table 3-13, Summary of Activity Levels Matched with Relevant Objectives, Alternative 4, to determine the objectives that are relevant to the various activity groups.

As shown in this excerpt from table 3-13, there are several objectives that are relevant to activities undertaken on Federal lands in forest cluster 4 under Alternative 4, including Objective TS-O6:

		Forest Clusters					
Management Activities	**Objectives**	1 CR	2 R	3 R	4 R	5 R	6 R
Harvest	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,4,6,7,8,9,10,11; AQ-O1,2,3,4,5,6,7,9,10,12,13; HA-O2,3,5,6; HU-O1,3,4,5,6,7,9,13,14; RM-O1,2,4; AM-O1,2;	L	L	M	**M**	M	L
Thin	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,4,6,8,10; AQ-O1,2,3,4,5,6,7,9,10,12,13 HU-O3,4,7,9,13,14; HA-O1,2,3,5, 6; RM-O1,2,4; AM-O1,2	L	M	H	**H**	H	H
Decrease road density	EM-O1,2,3; PE-O1,2,3,4; TS-O1,4; AQ-O1,2,3,4,5,6,7,9,10,12,13,14; HA-O2,3,5,6; HU-O2,3,4,13,14; RM-O2,3; AM-O1,2	L	M	M	**M**	H	M
Watershed restoration	EM-O1,2,3; PE-O1,2,3,4; TS-O1,3,4,6,8,10; AQ-O1,2,3,4,5,6,7,9,10,13,14; HA-O1,2,3,5,6; HU-O3,4,7; RM-O1, 2,3,4; AM-O1,2	M	H	M	**M**	M	L
Prescribed burning	EM-O1,2,3,4; PE-O1,2,3,45; TS-O1,2,3,4,6,8,10; AQ-O1,2,3,4,5,6,7,9,10,12,13; HA-O1,2,3,5,6; HU-O3,4,9,13,14; RM-O2; AM-O1,2	H	H	M	**M**	H	M
Prescribed fire plans	EM-O1,2,3,4; PE-O1,2,3,4,5; TS-O1,2,6,8,10; AQ-O1,2,3,4,5,6,7,9,10,12,13,14; HA-O1,2,3,5,6; HU-O3,4,9, 17; RM-O2; AM-O1,2	H	H	M	**M**	H	M

8. Turn to table 3-5, Description of Objectives and Standards, to find the objectives and standards, including Objective TS-O6.

This excerpt from the table includes the following description of Objective TS-O6, under Alternative 4.

Table 3-5 Description of Objectives and Standards	
Objective TS-O6:	Restore ecosystem processes by managing vegetation structure, stand density, species composition, patch size, pattern, and fuel loading and distribution so ecosystems are resilient to endemic levels of fire, insects, and disease. Restoration is the emphasis and priority for the mid- and late-seral, dense multi-layer communities in currently roaded portions of Forest Clusters 2, 3, 5, and 6. Timber production is a byproduct of resoration activities.

9. Turn to table 3-6, Management Activities on UCRB Forestlands, to find the level of activity for the first decade in Alternative 4, forest cluster 4. (*We see that a total of 305,000 to 410,000 acres would be subject to various harvest techniques including commercial thinning; 470,000 to 645,000 acres would be treated with pre-commercial thinning; and 425,000 to 575,000 acres would be treated with prescribed fire. From 290,000 to 390,000 acres would be treated with watershed restoration techniques, and there would be a net reduction in native surface roads of 25 to 50 percent on Federal lands.*)

ACRES (thousands per decade)														
Forest Cluster	Harvest				Thin				Prescribed Burning				Riparian Restr.	Roads Decrs.(%)
	dry	moist	cold	**Total**	dry	moist	cold	**Total**	dry	moist	cold	**Total**		
1	10-14	15-20	5-6	30-40	15-20	11-15	9-10	35-45	135-185	105-140	75-100	315-425	175-230	0-25
2	65-85	95-125	20-35	180-245	120-150	85-115	60-85	260-350	215-290	165-225	125-165	505-680	445-605	25-50
3	50-65	75-95	15-25	140-185	75-105	60-80	40-50	175-235	75-105	60-80	40-50	175-235	120-160	25-50
4	100-145	160-220	45-50	**305-410**	200-280	155-205	115-160	**470-645**	185-250	140-190	100-135	**425-575**	**290-390**	**25-50**
5	7-10	10-15	3-5	20-30	15-20	11-15	9-10	35-45	15-20	10-15	5-10	30-45	15-25	50 +
6	20-23	25-35	5-7	50-65	45-60	35-50	30-35	110-145	55-75	40-55	30-40	125-170	30-45	25-50
Total	250-340	380-510	95-125	**725-975**	470-635	355-480	260-350	**1085-1465**	680-925	520-700	375-505	1575-2130	1075-1455	

In summary, under Alternative 4, Federal land near Libby, Montana, would generally be managed with a Restore emphasis, with a moderate level of timber harvest, high level of thinning, and moderate levels of decreased road density, watershed restoration, and prescribed burning.

✓ *Where do I find information common to all of the action alternatives?*

The section entitled Features Common to Alternatives 3 through 7 discusses the conditions and aspects shared by all of the "action" alternatives. This section includes:

- Five goals, derived from the purpose and need, and issues for the project. (*Example: "Sustain and where necessary restore the health of forest, rangeland, aquatic, and riparian ecosystems."*)
- Some aspects of a "desired range of future conditions,"—a vision of the long-term condition of the land. (*Example: "There is no downward trend in quality and quantity of riparian areas, wetlands, and lakes. Some are showing an upward trend."*)

✓ *What is each alternative trying to achieve?*

The Desired Range of Future Conditions (DRFC) describes what we desire or expect each alternative to achieve. The DRFC is a portrayal of the land, resource, and social and economic conditions that are expected to result in 50 to100 years if the alternative is carried out. The DRFC for each alternative is found in two places: the parts of the DRFC common to Alternatives 3 through 7 are in the section of this chapter called Features Common to Alternatives 3 through 7; and the parts of the DRFC unique to an individual alternative are included as part of the description of each alternative.

✓ *Where can I find general information about each alternative?*

General information is included in the narrative description of each alternative. This description includes:

- A theme (brief description of the alternative's focus or emphasis);
- The DRFC expected to be achieved if the alternative were implemented.

General features of each alternative are also illustrated on the maps accompanying each alternative.

✓ *What are the "pieces" of each alternative?*

Each alternative consists of several pieces that must be linked to fully understand the alternative's intent and application. These pieces and their linkages are described below. (Please refer to the first two questions in this User's Guide for a step-by-step example of how these pieces fit together.)

As described in the answer to the previous question, some of the alternative pieces provide general information. Other pieces provide more detailed information:

- Table 3-10, Comparison of Alternatives by Management Emphases, shows the management emphasis assigned to each forest and range cluster under each alternative. Management emphases, which reflect an overall approach to management, includes Conserve (C), Restore (R), Produce (P), Conserve-Restore (C-R), Restore-Produce (R-P), and Produce-Conserve (P-C). (*Example: The management emphasis of forest cluster 4 under Alternative 4 is Restore.)* (Please turn to the first page of the Objectives and Standards section of this chapter for definitions of the management emphsis terms *Produce, Restore*, and *Conserve*.)
- Appendix L includes the rules for assigning the management emphases shown in table 3-10 into levels of management activities. *(Example: The Restore management emphasis for forest clusters translates into a low or moderate harvest level, with three or more restoration activities planned at moderate or higher levels.)*
- Table 3-11, Comparison of Alternatives by Management Activity and Cluster, applies the rules described in Appendix L to forest and range clusters under each specific alternative. *(Example: In forest cluster 4 under Alternative 4, a moderate harvest level is assigned, with moderate to high levels of restoration activities such as thinning, decreasing road density, watershed restoration, and prescribed burning. (Prescribed fire planning was not considered a restoration activity.))*
- Table 3-12, Cluster Activity Level Assumptions for All Action Alternatives, (for both forest and range) interprets the low, medium, and high activity levels. *(Example: A moderate level of harvest means that 5 to 9 percent of all Federal forested land within the forest cluster would be treated within a decade.)*
- Table 3-13, Summary of Activity Levels Matched with Relevant Objectives, summarizes for each alternative the management emphasis and levels of management activities assigned to each cluster. These tables also indicate the objectives that are relevant to the use of the various groups of management activities. Identified groups of activities are applied in order to reach the objective, and, also, as constrained by the objectives. *(Example: Timber harvest in forest cluster 4 under Alternative 4 should be applied as prescribed by several objectives, including AQ-O1.)*
- Table 3-5, Description of Objectives and Standards, describes the objectives and standards for each alternative. Objectives are measurable and time-specific indicators against which progress can be gauged. (Unless stated otherwise, the objectives in table 3-5 are assumed to be implemented within 10 years. The quantification of the objective is found in the management activity, tables 3-6 and 3-7.) (*Example: Objective AQ-O1 states, "Restore watershed, soil productivity, stream channel, riparian, and soil integrity where functions are at levels that do not allow ecosystem sustainability and resilience. Implement watershed restoration activities at the levels described in tables 3-6 and 3-7.)* The objectives describe what is to be accomplished by management activities. Standards are mandatory actions or prohibitions needed to achieve the objectives. (*Example: Standard AQ-S2 says, "Monitoring plans shall be integrated with grazing management strategies for riparian areas within 10 years."* This standard states a mandatory action that is to be completed in order to accomplish Objective AQ-O1.

✓ *How can I quickly compare the "action" alternatives?*

To quickly compare the overall approach of the action alternatives, see table 3-8, Comparison of Alternatives by Theme.

See table 3-11, Comparison of Alternatives by Management Activity and Cluster, to compare the levels of management activities assigned to each forest or range cluster.

To compare the amounts and types of activities expected under each alternative, use tables 3-6 and 3-7, Management Activities on UCRB Forestlands, and Management Activities on UCRB Rangelands. These tables show the types of management activity groups and amount of activity, expressed as a range, in thousands of acres per decade, planned under the alternative. ***(While the range of management activity groups in these tables is part of the decision that could be made through this planning process, we have not assumed nor determined what portion of the activity group would be applied in a particular Forest Service- or BLM-administrative unit. Those assignments would be worked out among the land management agencies at a later time.)***

Table 3-10. Comparison of Alternatives by Management Emphases

	Alternatives						
	1	**2**	**3**	**4**	**5**	**6**	**7**
Forest Clusters							
1	C	C	CR	CR	C	CR	C
2	PC	C	R	R	CR	R	C
3	P	PC	R	R	R	R	CR
4	P	PC	RP	R	P	R	CR
5	P	CR	R	R	R	R	CR
6	PC	C	CR	R	RP	CR	C
Range Clusters							
1	P	PC	RP	R	RP	R	CR
2	C	C	C	CR	C	CR	C
3	PC	C	CR	R	CR	CR	C
4	P	PC	RP	R	PC	R	CR
5	P	PC	R	R	PC	CR	C
6	P	PC	RP	R	RP	R	CR

Table 3-11. Comparison of Alternatives by Management Activity and Cluster

Management Activity	Alternatives 1	2	3	4	5	6	7
Forest Cluster 1							
Harvest	L	L	L	L	L	L	L
Thin	L	L	L	L	L	L	L
Decrease Road Density	L	L	L	L	L	L	L
Watershed Restoration	L	M	M	M	M	M	L
Prescribed Burning	L	L	M	H	L	M	L
Prescribed Fire Plan	H	H	H	H	H	H	H
Forest Cluster 2							
Harvest	M	L	L	L	L	L	L
Thin	L	L	L	M	L	M	L
Decrease Road Density	L	L	M	M	L	M	M
Watershed Restoration	L	M	M	H	M	M	L
Prescribed Burning	L	L	M	H	M	M	L
Prescribed Fire Plan	H	H	H	H	H	H	H
Forest Cluster 3							
Harvest	H	M	M	M	M	L	L
Thin	M	L	M	H	H	M	L
Decrease Road Density	L	L	M	M	M	H	H
Watershed Restoration	L	M	M	M	M	M	L
Prescribed Burning	L	L	M	M	M	M	M
Prescribed Fire Plan	L	L	L	M	M	M	H
Forest Cluster 4							
Harvest	H	M	M	M	H	M	L
Thin	M	M	H	H	H	H	L
Decrease Road Density	L	L	M	M	L	M	M
Watershed Restoration	L	L	L	M	L	M	L
Prescribed Burning	L	L	L	M	L	M	M
Prescribed Fire Plan	L	L	L	M	L	M	M
Forest Cluster 5							
Harvest	H	L	M	M	M	L	L
Thin	M	M	H	H	H	H	M
Decrease Road Density	L	M	H	H	M	M	H
Watershed Restoration	L	L	L	M	M	M	L
Prescribed Burning	L	L	M	H	M	H	L
Prescribed Fire Plan	L	L	M	H	H	H	M
Forest Cluster 6							
Harvest	M	L	L	L	M	L	L
Thin	L	L	H	H	M	H	L
Decrease Road Density	L	L	L	M	L	L	L
Watershed Restoration	L	L	L	L	L	L	L
Prescribed Burning	L	L	M	M	M	M	M
Prescribed Fire Plan	L	L	M	M	L	M	M

Table 3-11. Comparison of Alternatives by Management Activity and Cluster (continued).

Management Activity	Alternatives 1	2	3	4	5	6	7
Range Cluster 1							
Livestock Management	L	M	M	M	L	M	H
Improve Rangeland	L	L	M	M	L	M	L
Decrease Road Density	L	L	L	H	M	M	M
Riparian Restoration	L	L	L	M	L	M	L
Prescribed Burning	L	L	M	H	M	H	M
Prescribed Fire Plan	L	L	M	H	H	H	H
Range Cluster 2							
Livestock Management	H	H	H	H	H	H	H
Improve Rangeland	L	L	L	L	L	L	L
Decrease Road Density	L	L	L	L	L	L	L
Riparian Restoration	L	L	L	M	L	M	L
Prescribed Burning	L	L	M	H	M	M	L
Prescribed Fire Plan	H	H	H	H	H	H	H
Range Cluster 3							
Livestock Management	M	H	H	H	H	H	H
Improve Rangeland	L	L	L	M	M	M	L
Decrease Road Density	L	L	L	M	L	L	M
Riparian Restoration	L	M	M	M	L	L	L
Prescribed Burning	L	L	M	H	M	M	L
Prescribed Fire Plan	L	L	M	H	M	H	H
Range Cluster 4							
Livestock Management	L	M	M	M	M	M	H
Improve Rangeland	L	L	L	M	L	M	L
Decrease Road Density	L	L	M	M	L	M	M
Riparian Restoration	L	L	L	M	M	M	M
Prescribed Burning	L	L	M	M	L	L	L
Prescribed Fire Plan	L	L	L	M	L	M	M
Range Cluster 5							
Livestock Management	L	M	M	H	M	H	H
Improve Rangeland	L	L	M	M	L	L	L
Decrease Road Density	L	L	L	L	L	L	L
Riparian Restoration	L	L	M	M	M	M	L
Prescribed Burning	L	L	M	M	L	M	M
Prescribed Fire Plan	L	L	L	M	L	M	H
Range Cluster 6							
Livestock Management	L	M	M	H	M	H	H
Improve Rangeland	L	L	M	H	M	M	L
Decrease Road Density	L	L	L	M	L	M	M
Riparian Restoration	L	L	M	M	M	M	M
Prescribed Burning	L	L	L	L	L	L	L
Prescribed Fire Plan	L	L	L	L	L	L	M

Table 3-12. Cluster Activity Level Assumptions for All Action Alternatives

		Low	Moderate	High
Forest				
Harvest (commercial)	Alts. 1,2,7 >	0-4	4-8	8-10
(Percent of all forested area treated/decade)	Alts. 3-6 >	0-5	5-9	9-11
Thin (pre-commercial) (Percent of all forested area treated/decade)		0-3	3-6	6-8
Decrease Road Density (Percent of total road miles reduced/decade)		0-25	25-50	50+ Chg. RDC[1]
Watershed Restoration (Percent of all forested area treated/decade)		0-3	3-6	6-8
Prescribed Burning (Percent of all forested area treated/decade)		0-5	5-9	9-11
Prescribed Fire Plans (Percent of all forestland with implemented plans/decade)		0-20	20-40	40+
Range				
Livestock Management (Percent of all rangeland with improved management)		0-6	6-12	12-20
Improve Rangelands (Percent of all rangeland treated/decade)		0-4	4-8	8-11
Decrease Road Density (Percent of total road miles reduced/decade)		0-25	25-50	50+ Chg. RDC[1]
Riparian Restoration (Percent of all riparian areas treated/decade)		0-25	25-50	50-75
Prescribed Burning (Percent of all rangeland treated/decade)		0-3	3-6	6-9
Prescribed Fire Plans (Percent of all rangeland with implemented plans/decade)		0-20	20-40	40+

Harvest. All commercial harvest methods (for example single tree selection, group selection, shelterwood, seed tree, overstory removal, clearcut, and commercial thinning from above or below)

Thin. All pre-commercial thinnings used to alter forest structure, species composition, density, rate of growth, fuel ladders, fire behavior, etc.

Watershed Restoration. Includes increased road maintenance, improved road condition (surface and/or drainage), reduced road related erosion, road obliteration, increased large woody material, riparian plantings, in-channel restoration, etc.

Livestock Management. A summation of livestock management variables that affect rangeland health, including: grazing systems, changing riparian grazing management., season of use (length and timing), number of head, change of class, distribution, grazing deferment, and herding.

Improve Rangelands. Capital Investments: fencing, stock water improvements, seedings, control of invasion or spread of exotics, and non-fire shrub and juniper control.

Decrease Road Density. Permanent closure of unsurfaced roads.

Riparian Restoration. Includes improving road condition (drainage and/or surface), riparian plantings, in-channel restoration, and riparian exclosures.

Prescribed Burning. Management ignited fire.

Prescribed Fire Plan. Allows natural ignition fires to burn when in prescription and/or identifies areas that require prescribed burning.

[1] **Chg. RDC =** Change in road density class (see table with RDC definition).

Table 3-13. Summary of Activity Levels Matched with Relevant Objectives

Alternative 1

Management Activities	Objectives[1]	Forest Clusters 1 C[2]	2 PC	3 P	4 P	5 P	6 PC
Harvest	A1/PE-O1,2,3,4,5; A1/TE-O2,3,4,6; A1/AQ-O1,2,3,4,5; A1/HU-O2,3,5,7; HA-O6; AM-O1,2	L[3]	M	H	H	H	M
Thin	A1/PE-O1,2,3,4,5; A1/TE-O2,3,4,6; A1/AQ-O1,2,3,4,5; A1/HU-O2,3,5,7	L	L	M	M	M	L
Decrease road density	A1/TE-O2,6,7; AQ-O1,2,3,4,5; A1/HU-O2,3,10	L	L	L	L	L	L
Watershed restoration	A1/PE-O1,2,3,4,5; A1/TE-O2,4,6,7; A1/AQ-O1,2,3,4,5; A1/HU-O3,5,7; A1/IA-O1	L	L	L	L	L	L
Prescribed burning	A1/PE-O1,2,3,4,5,6; A1/TE-O1,2,7; A1/AQ-O2,3,4,5; A1/HU-O3,7	L	L	L	L	L	L
Prescribed fire plans	A1/PE-O1,2,3,4,5,6; A1/TE-O1,2,7; A1/AQ-O2,3,4,5; A1/HU-O3,7	H	H	L	L	L	L

Management Activities	Objectives[1]	Range Clusters 1 P	2 C	3 PC	4 P	5 P	6 P
Livestock Management	A1/PE-O1,2,3,4,5; A1/TE-O2,5,6; A1/AQ-O1,2,3,4,5; A1/HU-O2,3,5,7	L	H	M	L	L	L
Improve rangeland	A1/PE-O1,2,3,4,5; A1/TE-O2,6; A1/AQ-O1,2,3,4,5; A1/HU-O3,5,7	L	L	L	L	L	L
Decrease road density	A1/TE-O2,6; A1/AQ-O1,2,3,4,5; A1/HU-O2,3,10	L	L	L	L	L	L
Riparian restoration	A1/PE-O1,2,3,4,5; A1/TE-O2,6,7; A1/AQ-O2,3,4,5; A1/HU-O2,3,5,7; A1/IA-O1	L	L	L	L	L	L
Prescribed burning	A1/PE-O1,2,3,4,5,6; A1/TE-O1,2,7; A1/AQ-O2,3,4,5; A1/HU-O3,7	L	L	L	L	L	L
Prescribed fire plans	A1/PE-O1,2,3,4,5,6; A1/TE-O1,2,7; A1/AQ-O2,3,4,5; A1/HU-O3,7	L	H	L	L	L	L
Recreation activities	A1/PE-O1,2,3,4,5; A1/TE-O2,6,7; A1/AQ-O1,2,3,4,5; A1/HU-O1,3,5,7; HU-O10,11	—	—	—	—	—	—

[1] Objectives for Alternatives 1 and 2 vary according to the current plans for individual National Forests and BLM Resource Areas and may not correspond directly to the specific objectives prepared for Alternatives 3 to 7.
[2] Management Emphases: C = Conserve; CR = Conserve/Restore; R = Restore; RP = Restore/Produce; P = Produce; PC = Produce/Conserve
[3] See Table 3-12 for definitions and assumptions.

Alternative 2

Management Activities	Objectives[1]	Forest Clusters 1 C	2 C	3 PC	4 PC	5 CR	6 C
Harvest	A2/AQ-O1,2,3,4; HA-O6; AM-O1,2	L	L	M	M	L	L
Thin	A2/AQ-O1,2,3,4	L	L	L	M	M	L
Decrease road density	A2/AQ-O1,2,3,4	L	L	L	L	M	L
Watershed restoration	A2/AQ-O1,2,3,4	M	M	M	L	L	L
Prescribed burning	A2/AQ-O1,2,3,4	L	L	L	L	L	L
Prescribed fire plans	A2/AQ-O1,2,3,4	H	H	L	L	L	L

		Range Clusters 1 PC	2 C	3 C	4 PC	5 PC	6 PC
Livestock Management	A2/AQ-O1,2,3,4	M	H	H	M	M	M
Improve rangeland	A2/AQ-O1,2,3,4	L	L	L	L	L	L
Decrease road density	A2/AQ-O1,2,3,4	L	L	L	L	L	L
Riparian restoration	A2/AQ-O1,2,3,4	L	L	M	L	L	L
Prescribed burning	A2/AQ-O1,2,3,4	L	L	L	L	L	L
Prescribed fire plans	A2/AQ-O1,2,3,4	L	H	L	L	L	L
Recreation activities	A2/AQ-O2,3; HU-O10,11	—	—	—	—	—	—

[1] Objectives for Alternatives 1 and 2 vary according to the current plans for individual National Forests and BLM Resource Areas and may not correspond directly to the specific objectives prepared for Alternatives 3 to 7.

Table 3-13. Summary of Activity Levels Matched with Relevant Objectives (continued).

Alternative 3

Management Activities	Objectives	Forest Clusters 1 CR	2 R	3 R	4 RP	5 R	6 CR
Harvest	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,4,6,7,8,9,10,11; AQ-O1,2,3,4,5,6,7,9,10,12,13; HA-O2,3,5,6; HU-O1,3,4,5,6,7,9,13,14; RM-O1,2,4; AM-O1,2	L	L	M	M	M	L
Thin	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,3,4,6,8,10; AQ-O1,2,3,4,5,6,7,9,10,12,13; HA-O1,2,3,5,6; HU-O3,4,7,9, 13,14;RM-O1,2,4; AM-O1,2	L	L	M	H	H	H
Decrease road density	EM-O1,2,3; PE-O1,2,3,4; TS-O1,4; AQ-O1,2,3,4,5,6,7,9,10,12,13,14; HA-O2,3,5,6; HU-O2,3,4,13,14; RM-O2,3; AM-O1,2	L	M	M	M	H	L
Watershed restoration	EM-O1,2,3; PE-O1,2,3,4; TS-O1,3,4,6,8,10; AQ-O1,2,3,4,5,6,7,9,10,13,14; HA-O1,2,3,5,6; HU-O3,4,7; RM-O1, 2,3,4; AM-O1,2	M	M	M	L	L	L
Prescribed burning	EM-O1,2,3,4; PE-O1,2,3,4,5; TS-O1,2,3,4,6,8,10; AQ-O1,2,3,4,5,6,7,9,10,12,13; HA-O1,2,5,6; HU-O3,4,9,13,14; RM-O2; AM-O1,2	M	M	M	L	M	M
Prescribed fire plans	EM-O1,2,3,4; PE-O1,2,3,4,5; TS-O1,2,6,8,10; AQ-O1, 2,3,4,5,6,7,9,10,12,13,14; HA-O1,2,5,6; HU-O3,4,9, 17; RM-O2; AM-O1,2	H	H	L	L	M	M

Management Activities	Objectives	Range Clusters 1 RP	2 C	3 CR	4 RP	5 R	6 RP
Livestock Management	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,3,4,12,13,14,15; AQ-O1,2,3,4,5,6,7,910,11,12,13,14; HA-O2,3,4,5,6,7; HU-O1,3,4,5,6,7; RM-O2; AM-O1,2	M	H	H	M	M	M
Improve rangeland	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,2,3,4,5,12,13,14,15; AQ-O1,2,3,4,5,6,7,9,10,11,12,13,14; HA-O1,2,3,4,5,6; HU-O3,4,7,14; RM-O2; AM-O1,2	M	L	L	L	M	M
Decrease road density	EM-O1,2,3; PE-O1,2,3,4; TS-O1,4,12,15; AQ-O1,2,3,4,5,6,7,9,10,12,13,14; HA-O2,3,4,5,6; HU-O2,3,4,13,14; RM-O2,3; AM-O1,2	L	L	L	M	L	L
Riparian restoration	EM-O1,2,3; PE-O1,2,3,4; TS-O1,3,4,5,12,14,15; AQ-O1, 2,3,4,5,6,7,9,10,11,12,13,14; HA-O1,2,3,4,5,6; HU-O3,4,7; RM-O1,2,3,4; AM-O1,2	L	L	M	L	M	M
Prescribed burning	EM-O1,2,3,4; PE-O1,2,3,4,5; TS-O1,2,3,4,12,15; AQ-O1,2,3,4,5,6,7,9,10,12,13; HA-O1,2,5,6; HU-O3,4,9; RM-O2; AM-O1,2	M	M	M	M	M	L
Prescribed fire plans	EM-O1,2,3,4; PE-O1,2,3,45; TS-O1,2,12,15; AQ-O1,2,3,4,5,6,7,9,10,12,13,14; HA-O2,3,4,5,6; HU-O3,4,9; RM-O2; AM-O1,2	M	H	M	L	L	L
Recreation activities	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,4,12; AQ-O1,2,3,4,7,9,12,13; HA-O4,5,6; HU-O1,2,3,4,7,8,10,11,12; RM-O1,2,3,4; AM-O1,2	—	—	—	—	—	—

Alternative 4

Management Activities	Objectives	Forest Clusters 1 CR	2 R	3 R	4 R	5 R	6 R
Harvest	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,4,6,7,8,9,10,11; AQ-O1,2,3,4,5,6,7,9,10,12,13; HA-O2,3,5,6; HU-O1,3,4,5,6,7.9,13,14; RM-O1,2,4; AM-O1,2;	L	L	M	M	M	L
Thin	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,4,6,8,10; AQ-O1,2,3,4,5,6,7,9,10,12,13 HU-O3,4,7,9,13,14; HA-O1,2,3,5, 6; RM-O1,2,4; AM-O1,2	L	M	H	H	H	H
Decrease road density	EM-O1,2,3; PE-O1,2,3,4; TS-O1,4; AQ-O1,2,3,4,5,6,7,9,10,12,13,14; HA-O2,3,5,6; HU-O2,3,4,13,14; RM-O2,3; AM-O1,2	L	M	M	M	H	M
Watershed restoration	EM-O1,2,3; PE-O1,2,3,4; TS-O1,3,4,6,8,10; AQ-O1,2,3,4,5,6,7,9,10,13,14; HA-O1,2,3,5,6; HU-O3,4,7; RM-O1, 2,3,4; AM-O1,2	M	H	M	M	M	L
Prescribed burning	EM-O1,2,3,4; PE-O1,2,3,45; TS-O1,2,3,4,6,8,10; AQ-O1,2,3,4,5,6,7,9,10,12,13; HA-O1,2,3,5,6; HU-O3,4,9,13,14; RM-O2; AM-O1,2	H	H	M	M	H	M
Prescribed fire plans	EM-O1,2,3,4; PE-O1,2,3,4,5; TS-O1,2,6,8,10; AQ-O1,2,3,4,5,6,7,9,10,12,13,14; HA-O1,2,3,5,6; HU-O3,4,9, 17; RM-O2; AM-O1,2	H	H	M	M	H	M
		Range Clusters 1 R	2 CR	3 R	4 R	5 R	6 R
Livestock Management	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,3,4,12,13,14,15; AQ-O1,2,3,4,5,6,7,910,11,12,13,14; HA-O2,3,4,5,6,7; HU-O1,3,4,5,6,7; RM-O2; AM-O1,2	M	H	H	M	H	H
Improve rangeland	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,2,3,4,5,12,13,1415; AQ-O1,2,3,4,5,6,7,9,10,11,12,13,14; HA-O1,2,3,4,5,6; HU-O3,4,7,14; RM-O2; AM-O1,2	M	L	M	M	M	H
Decrease road density	EM-O1,2,3; PE-O1,2,3,4; TS-O1,4,12,15; AQ-O1,2,3,4,5,6,7,9,10,12,13,14; HA-O2,3,4,5,6; HU-O2,3,4,13,14; RM-O2,3; AM-O1,2	H	L	M	M	L	M
Riparian restoration	EM-O1,2,3; PE-O1,2,3,4; TS-O1,3,4,5,12,14,15; AQ-O1,2,3,4,5,6,7,9,10,11,12,13,14; HA-O1,2,3,4,5,6; HU-O3,4,7; RM-O1,2,3,4; AM-O1,2	M	M	M	M	M	M
Prescribed burning	EM-O1,2,3,4; PE-O1,2,3,4,5; TS-O1,2,3,4,12,15; AQ-O1,2,3,4,5,6,7,9,10,12,13; HA-O1,2,5,6; HU-O3,4,9; RM-O2; AM-O1,2	H	H	H	M	M	L
Prescribed fire plans	EM-O1,2,3,4; PE-O1,2,3,4,5; TS-O1,2,12,15; AQ-O1,2,3,4,5,6,7,9,10,12,13,14; HA-O2,3,4,5,6; HU-O3,4,9; RM-O2; AM-O1,2	H	H	H	M	M	L
Recreation activities	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,4,12; AQ-O1,2,3,4,7,9,12,13; HA-O4,5,6; HU-O1,3,4,7,8,10,11,12; RM-O1,2,3,4; AM-O1,2	—	—	—	—	—	—

Table 3-13. Summary of Activity Levels Matched with Relevant Objectives (continued).

Alternative 5

Management Activities	Objectives	Forest Clusters 1 C	2 CR	3 R	4 P	5 R	6 RP
Harvest	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,4,6,7,8,9,10,11; AQ-O1,2,3,4,5,6,7,8,9,10,12,13; HA-O2,3,5,6; HU-O1,3,4,5,7,9,13,14; RM-O1,2,4; AM-O1,2;	L	L	M	H	M	M
Thin	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,3,4,6,8,10; AQ-O1,2,3,4,5,6,7,8,9,10,12,13; HU-O3,4,7,9,13,14; HA-O1,2, 3,5,6; RM-O1,2,4; AM-O1,2	L	L	H	H	H	M
Decrease road density	EM-O1,2,3; PE-O1,2,3,4; TS-O1,4; AQ-O1,2,3,4,5,6,7,8,9,10,12,13,14; HA-O2,3,5,6; HU-O2,3,4,13,14; RM-O2,3; AM-O1,2	L	L	M	L	M	L
Watershed restoration	EM-O1,2,3; PE-O1,2,3,4; TS-O1,3,4,6,8,10; AQ-O1,2,3,4,5,6,7,8,9,10,13,14; HA-O1,2,3,5,6; HU-O3,4,7; RM-O1, 2,3,4; AM-O1,2	M	M	M	L	M	L
Prescribed burning	EM-O1,2,3,4; PE-O1,2,3,45; TS-O1,2,3,4,6,8,10; AQ-O1,2,3,4,5,6,7,8,9,10,12,13; HA-O1,2,5,6; HU-O3,4,9,13,14; RM-O2; AM-O1,2	L	M	M	L	M	M
Prescribed fire plans	EM-O1,2,3,4; PE-O1,2,3,4,5; TS-O2,3,4,6,8,10; AQ-O1,2,3,4,5,6,7,8,9,10,12,13,14; HA-O1,2,5,6; HU-O3,4,9,17; RM-O2; AM-O1,2	H	H	M	L	H	L

Management Activities	Objectives	Range Clusters 1 RP	2 C	3 CR	4 PC	5 PC	6 RP
Livestock Management	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,3,4,12,13,14,15,16; AQ-O1,2,3,4,5,6,7,8,910,11,12,13,14; HA-O2,3,4,5,6,7; HU-O1,3,4,5,7; RM-O2; AM-O1,2	L	H	H	M	M	M
Improve rangeland	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,2,3,4,5,12,13,14,15; AQ-O1,2,3,4,5,6,7,8,9,10,11,12,13,14; HA-O1,2,3,4,5, 6; HU-O3,4,7,14; RM-O2; AM-O1,2	L	L	M	L	L	M
Decrease road density	EM-O1,2,3; PE-O1,2,3,4; TS-O1,4,12,15; AQ-O1,2,3,4,5,6,7,8,9,10,12,13,14; HA-O2,3,4,5,6; HU-O2,3, 4,13,14; RM-O2,3; AM-O1,2	M	L	L	L	L	L
Riparian restoration	EM-O1,2,3; PE-O1,2,3,4; TS-O1,3,4,5,12,14,15; AQ-O1,2,3,4,5,6,7,8,9,10,11,12,13,14; HA-O1,2,3,4,5,6; HU-O3,4,7; RM-O1,2,3,4; AM-O1,2	L	L	L	M	M	M
Prescribed burning	EM-O1,2,3,4; PE-O1,2,3,4,5; TS-O1,2,3,4,12,15,16; AQ-O1,2,3,4,5,6,7,9,10,12,13; HA-O1,2,5,6; HU-O3,4,9; RM-O2; AM-O1,2	M	M	M	L	L	L
Prescribed fire plans	EM-O1,2,3,4; PE-O1,2,3,4,5; TS-O1,2,12,15; AQ-O1,2,3,4,5,6,7,8,9,10,12,13,14; HA-O2,3,4,5,6; HU-O3,4,9; RM-O2; AM-O1,2	H	H	M	L	L	L
Recreation activities	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,4,12; AQ-O1,2,3,4,7,9,12,13; HA-O4,5,6; HU-O1,3,4,7,8,10,11,12; RM-O1,2,3,4; AM-O1,2	—	—	—	—	—	—

Alternative 6

Management Activities	Objectives	Forest Clusters 1 CR	2 R	3 R	4 R	5 R	6 CR
Harvest	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,4,6,7,8,9,10,11; AQ-O1,2,3,4,5,6,7,9,10,12,13; HA-O2,3,5,6; HU-O1,3,4,5,6,7,9,13,14; RM-O1,2,4; AM-O1,2	L	L	L	M	L	L
Thin	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,3,4,6,8,10; AQ-O1,2,3,4,5,6,7,9,10,12,13; HU-O3,4,7,9,13,14; HA-O1,2, 3,5,6; RM-O1,2,4; AM-O1,2	L	M	M	H	H	H
Decrease road density	EM-O1,2,3; PE-O1,2,3,4; TS-O1,4; AQ-O1,2,3,4,5,6,7,9,10,12,13,14; HA-O2,3,5,6; HU-O2,3,4,13,14; RM-O2,3; AM-O1,2	L	M	H	M	M	L
Watershed restoration	EM-O1,2,3; PE-O1,2,3,4; TS-O1,3,4,6,8,10; AQ-O1,2,3,4,5,6,7,9,10,13,14; HA-O1,2,3,5,6; HU-O3,4,7; RM-O1, 2,3,4; AM-O1,2	M	M	M	M	M	L
Prescribed burning	EM-O1,2,3,4; PE-O1,2,3,45; TS-O1,2,3,4,6,8,10; AQ-O1,2,3,4,5,6,7,9,10,12,13; HA-O1,2,5,6; HU-O3,4,9,13,14; RM-O2; AM-O1,2	M	M	M	M	H	M
Prescribed fire plans	EM-O1,2,3,4; PE-O1,2,3,4,5; TS-O1,2,6,8,10; AQ-O1,2,3,4,5,6,7,9,10,12,13,14; HA-O1,2,5,6; HU-O3,4,9, 17; RM-O2; AM-O1,2	H	H	M	M	H	M

Management Activities	Objectives	Range Clusters 1 R	2 CR	3 CR	4 R	5 CR	6 R
Livestock Management	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,3,4,12,13,14,15; AQ-O1,2,3,4,5,6,7,910,11,12,13,14; HA-O2,3,4,5,6,7; HU-O1,3,4,5,6,7; RM-O2; AM-O1,2	M	H	H	M	H	H
Improve rangeland	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,2,3,4,5,12,13,1415; AQ-O1,2,3,4,5,6,7,9,10,11,12,13,14; HA-O1,2,3,4,5,6; HU-O3,4,7,14; RM-O2; AM-O1,2	M	L	M	M	L	M
Decrease road density	EM-O1,2,3; PE-O1,2,3,4; TS-O1,4,12,15; AQ-O1,2,3,4,5,6,7,9,10,12,13,14; HA-O2,3,4,5,6; HU-O2,3,4,13,14; RM-O2,3; AM-O1,2	M	L	L	M	L	M
Riparian restoration	EM-O1,2,3; PE-O1,2,3,4; TS-O1,3,4,5,12,14,15; AQ-O1, 2,3,4,5,6,7,9,10,11,12,13,14; HA-O1,2,3,4,5,6; HU-O3,4,7; RM-O1,2,3,4; AM-O1,2	M	M	L	M	M	M
Prescribed burning	EM-O1,2,3,4; PE-O1,2,3,4,5; TS-O1,2,3,4,12,15; AQ-O1,2,3,4,5,6,7,9,10,12,13; HA-O1,2,5,6; HU-O3,4,9; RM-O2; AM-O1,2	H	M	M	L	M	L
Prescribed fire plans	EM-O1,2,3,4; PE-O1,2,3,4,5; TS-O1,2,12,15; AQ-O1,2,3,4,5,6,7,9,10,12,13,14; HA-O2,3,4,5,6; HU-O3, 4,9; RM-O2; AM-O1,2	H	H	H	M	M	L
Recreation activities	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,4,12; AQ-O1,2,3,4,7,912,14; HA-O4,5,6; HU-O1,3,4,7,8,10,11,12; RM-O1,2,3,4; AM-O1,2	—	—	—	—	—	—

Table 3-13. Summary of Activity Levels Matched with Relevant Objectives (continued).

Alternative 7

Management Activities	Objectives	Forest Clusters 1 C	2 C	3 CR	4 CR	5 CR	6 C
Harvest	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,4,6,7,8,9,10,11; AQ-O1,2,3,4,5,6,7,8,9,10,12,13; HA-O2,3,5,6; HU-O1,3,4,5,6,7,9,13,14; RM-O1,2,4; AM-O1,2	L	L	L	L	L	L
Thin	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,3,4,6,8,10; AQ-O1,2,3,4,5,6,7,8,9,10,12,13; HU-O3,4,7,9,13,14; HA-O1,2,3,5,6; RM-O1,2,4; AM-O1,2	L	L	L	L	M	L
Decrease road density	EM-O1,2,3; PE-O1,2,3,4; TS-O1,4; AQ-O1,2,3,4,5,6,7,8,9,10,12,13,14; HA-O2,3,5,6; HU-O2,3,4,13,14; RM-O2,3; AM-O1,2	L	M	H	M	H	L
Watershed restoration	EM-O1,2,3; PE-O1,2,3,4; TS-O1,3,4,6,8,10; AQ-O1,2,3,4,5,6,7,8,9,10,13,14; HA-O1,2,3,5,6; HU-O3,4,7; RM-O1, 2,3,4; AM-O1,2	L	L	L	L	L	L
Prescribed burning	EM-O1,2,3,4; PE-O1,2,3,45; TS-O1,2,3,4,6,8,10; AQ-O1,2,3,4,5,6,7,8,9,10,12,13; HA-O1,2,5,6; HU-O3,4,9,13,14; RM-O2; AM-O1,2	L	L	M	M	L	M
Prescribed fire plans	EM-O1,2,3,4; PE-O1,2,3,4,5; TS-O1,2,3,4,6,8,10; AQ-O1,2,3,4,5,6,7,8,9,10,12,13,14; HA-O1,2,5,6; HU-O3,4,9,17; RM-O2; AM-O1,2	H	H	H	M	M	M

Management Activities	Objectives	Range Clusters 1 CR	2 C	3 C	4 CR	5 C	6 CR
Livestock Management	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,3,4,12,14,15; AQ-O1,2,3,4,5,6,7,8,910,11,12,13,14; HA-O2,3,4,5,6,7; HU-O1,3,4,5,6,7,14; RM-O2; AM-O1,2	H	H	H	H	H	H
Improve rangeland	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,3,4,5,12,14,15; AQ-O1,2,3,4,5,6,7,9,10,11,12,13,14; HA-O1,2,3,4,5,6; HU-O3,4,7; RM-O2; AM-O1,2	L	L	L	L	L	L
Decrease road density	EM-O1,2,3; PE-O1,2,3,4; TS-O1,4,12,15; AQ-O1,2,3,4,5,6,7,9,10,12,13,14; HA-O2,3,4,5,6; HU-O3,4,13, 14; RM-O2,3; AM-O1,2	M	L	M	M	L	M
Riparian restoration	EM-O1,2,3; PE-O1,2,3,4; TS-O1,3,4,5,12,14,15; AQ-O1,2,3,4,5,6,7,8,9,10,11,12,13,14; HA-O1,2,3,4,5,6; HU-O3,4,7,14; RM-O1,2,3; AM-O1,2	L	L	L	M	L	M
Prescribed burning	EM-O1,2,3,4; PE-O1,2,3,4,5; TS-O1,3,4,12,15; AQ-O1,2,3,4,5,6,7,9,10,12,13; HA-O1,2,5,6; HU-O3,4,9; RM-O2; AM-O1,2	M	L	L	L	M	L
Prescribed fire plans	EM-O1,2,3,4; PE-O1,2,3,4,5; TS-O1,2,12,15; AQ-O1,2,3,4,5,6,7,9,10,12,13,14; HA-O2,3,4,5,6; HU-O3,4,9; RM-O2; AM-O1,2	H	H	H	M	H	M
Recreation activities	EM-O1,2,3,4; PE-O1,2,3,4; TS-O1,4,12; AQ-O1,2,3,4,7,9,12,13; HA-O4,5,6; HU-O1,3,4,7,8,10,11,12; RM-O1,2,3,4; AM-O1,2	—	—	—	—	—	—

UCRB Chapter 4

Environmental Consequences

Contents

Key Terms

Biophysical Template ~ The successional and disturbance processes in combination with landform, soil, water, and climate conditions that formed the native ecosystem within which plants and animals evolved.

Cumulative Effects ~ Impacts on the environment that result from the impact of an action when added incrementally to other impacts of past, present, and reasonably foreseeable future actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

Direct Effects ~ Impacts on the environment that are caused by an action and occur at the same time and place as the action.

Ethno-habitats ~ Places socially and/or traditionally important to American Indians/tribes that are recognized and understood through their native culture, and which also related to familiar components of a landscape(s) where culturally significant life forms are found by participants in a culture - habitat places.

Historical Range of Variability (HRV) ~ The natural fluctuation of components of healthy ecosystems over time. In this EIS, refers to the range of conditions and processes that are likely to have occurred prior to settlement of the project area by Euroamericans (approximately the mid-1800s). Historical range of variability is discussed in this document as a reference point only. It establishes a baseline set of conditions for which sufficient scientific or historical information is available, and enables comparison to current conditions.

Indirect Effects ~ Impacts on the environment that are caused by an action, but occur later than or distant from the action, but are still reasonably foreseeable.

Interest Areas ~ A tribe's area of interest typically includes their reservation, any treaty ceded lands, tribal homelands, and adjacent lands where a tribe has maintained traditional land use interests. A tribe's area of interest usually has no discrete boundaries and may overlap those of neighboring tribes.

Irretrievable Commitments ~ A term that applies to the loss of production, harvest, or use of natural resources. For example, some or all of the timber production from an area is lost irretrievably while an area is serving as a winter sports site. The production lost is irretrievable, but the action is not irreversible. If the use changes, it is possible to resume timber production.

Irreversible Commitments ~ A term that describes the loss of future options. Applies primarily to the effects of use of nonrenewable resources, such as minerals or cultural resources, or to those factors, such as soil productivity that are renewable only over long periods of time.

Landscape Structure ~ The mix and distribution of stands or patch sizes across a given land. Patch sizes, shapes, and distributions are a reflection of the major disturbance regimes operating on the landscape.

Late-seral multi-layer ~ Refers to mature and old multi-layer forest as defined in Key Terms and the Desired Range of Future Conditions in Chapter 3.

Late-seral single-layer ~ Refers to mature and old single-layer forest as defined in Key Terms and the Desired Range of Future Conditions in Chapter 3.

Programmatic EIS ~ An EIS that provides a broad overview when a large-scale plan is being prepared for the management of federally administered lands on a regional or multi-regional basis. A programmatic EIS provides a valuable and necessary analysis of the affected environment and potential cumulative effects of the reasonably foreseeable actions under that program or within that geographical area. Analyses of lesser scope or more site-specificity may be tiered to the analysis in a programmatic EIS.

Terrestrial communities ~ Groups of vegetation cover types with similar moisture and temperature regimes, elevational gradients, structures, and use by vertebrate wildlife species.

Viable Populations ~ Populations that are regarded as having the estimated numbers and distribution of reproducting individuals to ensure its continued existence is well-distributed in the project area.

Introduction

This chapter discloses the environmental consequences of implementing each alternative (described in Chapter 3). It describes direct, indirect, and cumulative effects of Forest Service or BLM management on the existing conditions and affected environment (described in Chapter 2). The environmental consequences displayed here are based on the *Evaluation of EIS Alternatives by the Science Integration Team* (Quigley, Lee, and Arbelbide 1997). The Science Integration Team analyzed effects of the alternatives in both the UCRB and Eastside planning areas, constituting the cumulative effects.

This chapter forms the scientific and analytical basis for the relative comparison of effects presented towards the end of Chapter 3.

How the Chapter is Organized

The subject area categories to be discussed in this chapter include: Physical Aspects of the Ecosystem (Soils, Air Quality); Terrestrial Aspects (Forests, Rangelands, Viable Populations); Aquatic Aspects (Hydrology, Watershed Processes, and Riparian Areas and Wetlands; Aquatic Species Distribution and Viability); Landscape Health; Human Uses and Values; American Indian Tribes; and Ecological Integrity and Social/Economic Resiliency. The key effects are presented first under each subject area, followed by the assumptions used by the Science Integration Team (SIT) and the EIS Team in conducting the evaluation of alternatives, the causes of the effects being seen in the alternatives, how the effects were estimated, and the effects of the alternatives. The last section in the chapter provides a cost analysis of the alternatives.

Effects are presented for each subject area, depending on the scale at which the data were collected, the scale at which the Science Integration Team was best able to analyze the data, or the scale most appropriate for displaying differences among alternatives, by one or more of the following:

- Interior Columbia Basin (ICBEMP) Project Area
- Upper Columbia River Basin (UCRB) EIS Planning Area
- Ecological Reporting Units (ERU)
- Forest or Range Clusters
- Terrestrial Communities
- Potential Vegetation Groups (PVG)
- Riparian Areas
- Counties

Relationship to the Science Integration Team's Evaluation of Alternatives

The Science Integration Team (SIT) was directed by the Project Charter to assess, based on the best information available, the tradeoffs, consequences, outcomes, and interactions that are associated with each alternative. The evaluation was based on concepts documented in the Framework (Haynes et al. 1996). To the extent possible, the evaluations linked biological, cultural, social, and economic concerns at various scales.

The EIS Team developed the array of alternatives. The team also developed a set of evaluation criteria (Chapter 3 - Comparison of Alternatives) based on the needs statement, issues, and goals. The EIS Team and the SIT then jointly agreed on a set of indicator variables (quantitative measures of ecologic, economic, and social conditions), many of which were graphed for each alternative. The SIT considered them in the evaluation, and the EIS Team used them to show a relative comparison of how well each alternative met the evaluation criteria. See the Comparison of Alternatives section near the end of Chapter 3 for the graphs and for more information on the evaluation criteria and indicator variables.

The Science Integration Team analyzed the effects and practicality of implementing each alternative management strategy in the *Evaluation of EIS Alternatives* (Quigley, Lee, and Arbelbide 1997). The SIT's evaluation was based on the alternatives as they were initially developed in February 1996. In an effort to provide greater assurance that some or all of

the alternatives met the intent of the Endangered Species Act, Clean Water Act, Clean Air Act, and Federal trust responsibilities to tribes; and to address concerns among the Forest Service and BLM's partners (Federal, State, and county agencies; tribal governments; and Resource Advisory Councils); some of the objectives and standards were clarified or modified. The Science Integration Team re-examined the outcomes and effects for the revised alternatives, then provided the EIS Team with suggested revisions and input on changes that would likely occur as a result of the revised alternatives. A discussion of this process is contained in the *Evaluation of Alternatives* (Quigley, Lee, and Arbelbide 1997). Because the alternatives were only clarified and not completely rewritten, the SIT did not fully re-evaluate them (for example, neither the terrestrial species panels nor the social panels were reconvened); however, all material was examined to consider its appropriateness with the revised alternatives.

Outcomes of each alternative were evaluated relative to (a) maintaining and/or restoring forest, rangeland, riparian, and aquatic health and productivity; (b) maintaining economic, social, and cultural systems; and contributing to meeting Federal trust responsibilities to American Indian tribes. The *Evaluation of Alternatives* describes the likely outcomes and cumulative effects from the alternatives across the entire project area and was the basis for this chapter. In those few cases where SIT assumptions, models, or simulations did not accurately reflect the intent of the alternatives, the EIS Team further analyzed and disclosed the effects of the alternatives and provided rationale for deviating from the SIT evaluation. It is this final EIS Team analysis that is presented here and summarized in the Comparison of Alternatives section in Chapter 3. Unless otherwise specified, the tables in this chapter were adapted from the *Evaluation of Alternatives*.

How the Effects of the Alternatives Were Estimated

Source and Nature of Data and Databases

More than 170 Geographic Information System (GIS) data layers or themes were compiled or created in support of the Scientific Assessment and EISs. More than 20 databases were created in order to characterize historical to current conditions and predict possible alternative futures. The Spatial Assessment (Gravenmier et al. 1996, in Quigley, Lee, and Arbelbide 1997) lists the GIS data layers compiled by theme (generalized categories) and the scale or resolution of the data, and describes the major databases developed for the project. See the Spatial Assessment for more detailed discussion of data collected and GIS analysis procedures.

Current vegetation cover types and structural stages were classified from the Advanced Very High Resolution Radiometer (AVHRR) satellite imagery data (1 square kilometer raster, or approximately 250 square acres, data resolution) in consultation with ecologists throughout the project area. Historical vegetation maps were compiled showing major vegetation cover types and structural stages for the mid-1800s. This effort drew from historical journals, photos, early surveys, and knowledge of scientists studying historical vegetation within the project area. Sixth-field Hydrologic Unit Codes (subwatersheds) were subsampled using aerial photography to provide finer resolution and validate the satellite classification process. Stream survey data was compiled into a common database. Fish population parameters were drawn from

The *Evaluation of EIS Alternatives* by the Science Integration Team (Quigley et al. 1997) is available from the Pacific Northwest Research Station, P.O. Box 3890, Portland, OR 97208-3890. Publications phone number: (503) 326-7128.

existing databases and knowledge of fish biologists within the project area. Economic and social information was drawn from existing sources including the U.S. census, State, county, Forest Service, and BLM records. Information on terrestrial species was taken from the existing literature and knowledge of biologists.

Principal Analytical Techniques

The Science Integration Team and the EIS Team evaluated alternatives on the basis of the data and relationships described in the *Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins* (AEC; Quigley and Arbelbide 1996b). This included published and unpublished research, studies, and reports on ecosystem functions and processes, conservation biology, ecosystem health, and viable populations and social and economic systems. Conclusions regarding future conditions were partly based on computer models that were constructed to simulate historical, current, and projected future conditions of the project area. Inferences were based on available information and model results. The models, like all models of complex biological, physical, or economic systems, necessarily simplify reality. The models, which are limited by current knowledge, represent a synthesis of the knowledge of scientists familiar with the subjects of concern, and provide a way to quantify outcomes of implementing each alternative.

Computer models were used primarily to simulate future conditions in terrestrial and aquatic environments. The model used extensively for projections of landscape conditions, disturbances, terrestrial habitats, and biophysical relationships was the Columbia River Basin Successional Model, or CRBSUM (Hann et al. 1996, in Quigley, Lee, and Arbelbide 1997). This model simulates vegetation succession and disturbance processes for each potential vegetation type in the UCRB planning area. It assumes that succession proceeds along pathways that are altered by disturbance events, such as fire. While the predictions are expected to be accurate for each potential vegetation type and potential vegetation group, they are not spatially explicit, which means that the exact location of future disturbances cannot be determined.

Panels of scientists were used to project outcomes related to terrestrial and aquatic species habitat and population relationships. Risks to species populations and habitats were evaluated against historical, current, and future conditions. The panels examined broad-scale habitat changes projected through the simulation models, reviews of pertinent literature, and knowledge of project scientists and species experts to develop statements of habitat and population risks and uncertainty.

A panel of experts in social sciences, drawn from a wide variety of interested persons and groups within the project area, addressed potential outcomes from implementing the alternatives from several perspectives. These panels examined outcomes related to important social variables, cultural significance, and impacts perceived by panel members.

The *Evaluation of Alternatives* documents the approaches taken and provides more detailed discussion of outcomes, consequences, and interactions.

Incomplete and Unavailable Information

Requirements, Conclusions

The Council on Environmental Quality (CEQ) regulations for implementing the procedural provisions of the National Environmental Policy Act (NEPA) (40 CFR 1502.22) require that a Federal agency identify relevant information that may be incomplete or unavailable for an evaluation of reasonably foreseeable significant adverse effects in an EIS. If the information is essential to a reasoned choice among alternatives, it must be included or addressed in the EIS.

Knowledge is, and always will be, incomplete regarding many aspects of terrestrial and

aquatic species, forestlands, rangelands, the economy, and communities and their interrelationships. The ecology, inventory, and management of ecosystems is a complex and developing discipline. However, central ecologic relationships are well established, and a substantial amount of credible information about ecosystems in the project area is known. The alternatives were evaluated using the best available information.

The data collection effort for this decision is unprecedented and can generally be categorized into five basic groups: (1) databases (more than 20 were acquired or developed); (2) GIS themes (more than 170 were compiled or created); (3) expert panels/workshops (about 40 were convened); (4) contract reports (more than 130 were used); and (5) current literature reviews.

While additional information may add precision to estimates or better specify a relationship, new information is unlikely to significantly change the understanding of the relationships that form the basis of the evaluation of effects. Though new information would be welcomed, no missing information was deemed to be essential to a reasoned choice among the alternatives being considered at this scale and at this time.

Scale of Decision

This analysis addressed large, regional-scale trends and/or major changes in: ecological processes; landscape patterns and structures; succession and disturbance regimes; and habitat availability for threatened, endangered, and sensitive plant and animal species and communities. The analysis specifically focused on issues that require integrated management across broad landscapes. The analysis also addressed regional-scale trends and changes in the social and economic needs of people, cultures, and communities related to ecological trends and changes. The analysis did not identify site-specific effects because such information is not essential to determining broad-scale management direction.

Subsequent Analysis Before Projects

This EIS displays management alternatives and likely outcomes for broad-scale management direction. Before site-specific actions are implemented and an irreversible commitment of resources made, information essential to those fine-scale decisions should be obtained by the local managers. Localized data and information should be used to supplement or refine regional-level data and identify methods and procedures best suited to local conditions in order to achieve the objectives in this EIS. Further analyses may be necessary to deal with site-specific conditions and processes. These subsequent analyses will be used to bridge the gap between broad-scale direction and site-specific decisions. Some of this work, referred to as a step-down process, will be done by ICBEMP staff prior to publication of the Final EISs.

Monitoring and Review

Appendix 1 provides frameworks for implementation, monitoring, and adaptive management. Assumptions to which environmental consequences are most sensitive will be given priority for monitoring. Should there be new scientific information or change in conditions not projected under the selected alternative, there are provisions for changing programmatic management decisions to reflect new information and management practices. This process is part of adaptive management, and is guided by monitoring, research, and interagency oversight. Adaptive management, combined with the NEPA requirement to consider significant new information related to the effects of ongoing actions, reduces the likelihood that a current lack of information will either lead to unacceptable consequences or be considered essential.

For example, the precise relationships between the amount and quality of habitat and the future populations of species are uncertain. There is a certain level of risk inherent in the management of forests and rangelands even to standards based on conservative application of those relationships. If the relationship between habitat and population were significantly different from the way it now seems, the

population and long-term viability of affected species would be at greater risk than that generally estimated in this document.

Cumulative Effects

Cumulative effects, also called cumulative impacts, are those environmental consequences that result from the incremental effects of an activity when added to other past, present, and reasonably foreseeable future actions regardless of which agency or person undertakes them (see 40 CFR 1508.7).

The analysis and disclosure of cumulative effects alert decision-makers and the public to the context within which effects are occurring, and to the environmental implications of the interaction of the proposed action with other known and likely actions. Similarly, a programmatic EIS such as this one provides a program-wide analysis of a large area encompassing many of the environmental interactions that would be disclosed as cumulative effects in more site-specific NEPA documents.

The alternatives analyzed in this Draft EIS would establish management direction that allows for carrying out a large number of projects on lands administered by the Forest Service or the BLM. Possible cumulative effects that could result from consistent Federal actions across the project area would be mitigated through the implementation of Alternatives 3 through 7. During subsequent analyses for site-specific activities, local cumulative effects should be important considerations in the design of site-specific alternatives and mitigation measures.

Cumulative Effects on Federal Lands

In total there are approximately 144 million acres within the Interior Columbia Basin Ecosystem Management Project area, of which about 75 million are administered by the Forest Service or BLM. Approximately 42 million acres of Forest Service- or BLM-administered lands lie within the Upper Columbia River Basin EIS planning area.

The alternatives provide land and resource management direction across the lands administered by the Forest Service or BLM within the project area. The consistent management direction of Alternatives 3 through 7 within the Eastside and Upper Columbia River Basin EIS planning areas, combined with subsequent site-specific NEPA analysis and planning, provides a coordinated land and resource management structure that would be more comprehensive than most other efforts. These subsequent analyses will help to assure that the incremental and interactive effects on more than 75 million acres of the project area's ecosystems will continue to be considered in the implementation of the selected alternative. Adverse cumulative impacts may further be minimized or avoided through sub-regional coordination among the partners (tribes; Federal, State, and local agencies; and Resource Advisory Councils) as the selected alternative is implemented.

In light of the extremely broad geographic scope of the proposed action and the level of spatial resolution involved, the analysis in this EIS does not in most instances address all possible cumulative effects that may result at the site-specific level. However, any ground-disturbing actions will be conducted only after site-specific NEPA analysis, which will also analyze the impacts of the project on adjacent lands and resources within the watershed. Thus, managers will be able to design, analyze, and choose site-specific activities that minimize cumulative environmental effects that cannot be identified at the scale of this EIS.

Cumulative Effects on Non-Federal Land

For the purposes of this analysis, non-Federal lands include lands owned and/or managed by individuals, corporations, American Indian tribes, States, counties, or other agencies. The lead agencies in this EIS (the Forest Service and BLM) have no authority to regulate any activities or their timing on lands other than those they administer. However, when an action takes place on Federal land, it may cause direct, indirect, or cumulative effects on non-Federal lands.

The principal anticipated effects on non-Federal lands that can be evaluated at the broad-scale are changes in non-Federal timber harvest patterns and intensities. Other cumulative effects are likely to occur on non-Federal lands, such as shifting priorities for habitat and resource protection, and changes in types and intensities of current land uses (including recreation, grazing, and residential development). However, these effects cannot be rigorously evaluated at the broad scale, and moreover, are primarily driven by shifts in demographics, population changes, changes in technology, and other social and economic processes rather than by Federal land management policy.

Future timber harvest levels on non-Federal lands are expected to be similar under all alternatives, except for Alternative 7 in which it is predicted that non-Federal harvest levels would increase by as much as 20 percent in response to a 40 to 60 percent decline in Federal harvest levels. Such an increase would probably be short-lived because of the current and likely future age distributions of trees on private lands.

Timber harvest on non-Federal lands is controlled by State forest practices acts and a number of State and Federal regulations and incentives to protect the productivity and environmental quality of land, water, air, and biological resources. The amount of non-Federal forest and rangelands vary, as well as the individual State regulations. In general, there is a smaller proportion of non-Federal forest lands within the project area than, for instance, on the west side of the Cascade range. Due to variations in market conditions, the mix of Federal and non-Federal forest and rangelands, and differences in State regulations, it is difficult to predict effects on non-Federal habitats from decisions in any of the EIS alternatives. These would probably be more noticeable at local levels than at the broad scale.

If, for instance, a high market situation existed, and Alternative 7, which represents a significant reduction in timber harvest, were selected, there could be at least a short-term increase of harvest on non-Federal lands that could affect habitat in some places. With so many factors influencing outcomes, however, these kinds of effects are difficult to estimate.

Cumulative Effects from Non-Federal Actions

This Draft EIS also considers the likely effects on Federally administered lands from reasonably foreseeable management actions occurring on non-Federal land. There are potentially direct impacts from management of non-Federal land on terrestrial and aquatic wildlife species that move between Federal and non-Federal habitats during the year or during their life cycle. The role of management of non-Federal lands was considered in the *Evaluation of Alternatives* on those species and ecosystems, and is presented in the Terrestrial Species and Aquatics sections of this chapter.

Localized actions on non-Federal lands often affect local environmental conditions on nearby Federal land and may also affect Federal management decisions. For example, non-Federal road construction and harvest in a watershed with both Federal and non-Federal lands could result in a decision by Federal managers to postpone harvest to avoid further watershed degradation. An endemic species whose range and habitat are located on Federal and non-Federal lands might be forced to rely on the Federally managed portion of its range if the non-Federal portion were altered to the point of unsuitability. Access to timber on non-Federal land may require roads on Federal land. Each Federal action is subject to site-specific NEPA analysis before it may occur, and cumulative effects of non-Federal conditions and actions are part of such analysis. However, such impacts cannot be accurately identified or mitigated in this EIS given its broad scope.

Cumulative Effects in Subsequent Environmental Analysis

Ground-disturbing activities on Federally managed lands are conducted only after site-specific NEPA analysis has been completed. Such analyses are required to describe the

cumulative impacts of the site-specific alternatives on adjacent lands and resources, and on the watershed. This provides opportunities to detect and minimize cumulative environmental effects that cannot be specifically determined at the broad level of this EIS.

Other Environmental Consequences

The Council on Environmental Quality (CEQ) regulations require that this discussion include "... any adverse environmental effects which cannot be avoided should the proposal be implemented, the relationship between short-term uses of man_s environment and the maintenance and enhancement of long-term productivity, and any irreversible or irretrievable commitments of resources which would be involved in the proposal should it be implemented" (40 CFR 1502.16). These topics are addressed, where relevant, as part of the discussion of environmental consequences for each component of the environment.

Assumptions

The assumptions included at the beginning of each of the following sections were derived from the *Evaluation of Alternatives* (Quigley, Lee, and Arbelbide 1997) and from the EIS Team. They represent only those major assumptions that were considered by the EIS Team to be essential to the reader's understanding of how the alternatives were evaluated. The complete set of assumptions specific to the evaluation are available in the scientific document. Where relevant inconsistencies or inaccuracies in the SIT assumptions were found, or where clarifications were needed, they are noted. Assumptions generally refer to the action alternatives (Alternatives 3 through 7) unless otherwise noted.

Several assumptions were required by the SIT to analyze the alternatives as they are presented in Chapter 3. These included assumptions and conclusions regarding: (1) scientific understanding of ecological processes; (2) anticipated outcomes of prescribed management actions with respect to ecological processes; and (3) interpretation of the intent and implementation of the themes, objectives, and standards for each alternative.

General assumptions related to intent and implementation of the alternatives include the following:

- For Alternatives 1 through 7, it was assumed that nothing is designed or implied in the EIS alternatives that precludes or nullifies existing management agreements, recovery plans, and biological opinions that provide site-specific or species-specific strategies for sensitive endemic species. Likewise, species listed as threatened or endangered pursuant to the Endangered Species Act receive protection through Section 7 requirements, existing biological opinions, and critical habitat designations regardless of direction specified in the Draft EIS.

- For Alternatives 1 through 7, it was assumed that the same alternative would be selected and implemented in both the UCRB and Eastside planning areas.

- For Alternatives 1 through 7, evaluation of effects was based on alternative intent as articulated in alternative descriptions, themes, desired range of future conditions, objectives, and activity tables and rule sets, in conjunction with the required actions specified by the standards.

- For Alternatives 1 through 7, standards were considered to be required actions that would be implemented as specified, but guidelines were considered to be suggested techniques (not required) for achieving objectives.

Where necessary, the EIS Team made additional assumptions to prepare this Environmental Consequences chapter; these assumptions are described in the following sections. One key assumption made by the EIS Team is that the SIT used the concept of "historical range of variability" as a useful reference point for comparison of alternatives, although it does not in itself represent management goals and is not necessarily an indicator ecosystem health.

Effects of the Alternatives on Physical Aspects of the Ecosystem

This section presents the effects of alternatives on soils and air quality. Each subject area is discussed in the following order: the overall causes for the effects, the methods for determining effects, and the analysis of effects of the alternatives.

Soils

Assumptions

The following assumptions were made by the SIT and the EIS Team:

- Soil loss from road construction activities will continue to cause declines in soil

Summary of Key Effects and Conclusions

- In forestlands, Alternative 6 has the highest likelihood of reducing soil disturbances from current, followed closely by Alternatives 4 then 3, then by Alternatives 5, 2, 7 and 1. Because of the uncertainty associated with Alternative 7, reduction of soil disturbance could range from low to high, and could trend towards high in the long term. In rangelands, Alternative 3 has the highest likelihood of reducing soil disturbance from current, followed closely by Alternatives 5 and 6, then 4. Alternative 7 has a moderate likelihood of reducing soil disturbance from current, followed by Alternative 2. Alternative 1 is likely to increase soil disturbance from current levels, due largely to the increase in exotic plant invasion. Alternative 7 would have the highest likelihood of restoring floodplain and riparian soil functions in rangelands because the level of grazing disturbance would be about half that of the other alternatives. Actual effects on soil productivity from soil disturbance will depend on the type, extent, and method of disturbance, and existing condition of the soil and vegetation — all factors that cannot be adequately characterized at this scale.

- Alternatives 4 and 6 would have a higher likelihood of restoring and conserving organic matter and woody material to the soil ecosystem than the other alternatives because of the required minimum levels of coarse woody debris, and standing and downed large trees. Alternative 7 (inside reserves) would have highly variable levels of organic matter and wood because of unpredictable fire effects, but levels are expected to approach minimum requirements, particularly in the long term. Alternatives 3 and 5 are less likely to restore and conserve organic matter and woody material needed for sustainable soil productivity because of lower required minimums and the lack of large standing and downed trees. Amounts of organic matter and wood in Alternatives 1 and 2 are generally unspecified, and areas where soil productivity has declined due to loss of organic matter and coarse wood may continue to decline because of overall lack of consideration of soil requirements.

- Vegetation conditions similar to natural or historical range of variability, are more likely to maintain a stable and available nutrient supply, and thus sustain soil productivity and reduce risk of nutrient loss from uncharacteristic fire. Alternatives 3, 4, 5, and 6 are likely to result, more quickly, in achieving vegetation conditions similar to the historical range of variability, both in the short term and long term. An exception is Alternative 3, which may show greater departure of some forested landscapes from the historical range of variability. Alternatives 1, 2, and 7 have less emphasis than the other alternatives in achieving vegetation conditions similar to the historical range of variability, and consequently are less likely to result in sustainable soil and nutrient conditions; while Alternative 7 is fairly similar to Alternatives 3 through 6 in rangelands, it would not be as effective in reducing exotic weeds. Alternatives 1 and 2 would likely result in continuing and increasing departures of forested landscapes from the historical range of variability in forestlands and would not be effective in arresting the spread of exotics in rangelands.

- Alternative 4 provides the highest levels of watershed restoration and road closures that would restore hydrologic and soil function. Alternative 3, followed by Alternative 6, then Alternative 5 have fairly high levels of restoration focused at restoring hydrologic and soil function. Alternative 7 has high levels of road closures, but because it takes a more passive approach to restoration, it is anticipated that the majority of closures would only block access and, therefore, may present a higher risk to soil and hydrologic function in the short term than if they remained open. Alternative 5 would result in less watershed restoration and road closures that restore hydrologic and soil function than Alternatives 3, 4, 6, and 7; Alternatives 1 and 2 would have much lower levels than the other alternatives. Consequently, Alternatives 1 and 2 are not expected to improve soil and hydrologic function where it has declined. Where watershed and road restoration is focused in riparian areas, and where riparian vegetative cover is increased, floodplain and riparian area soils are most likely to improve.

productivity and accelerate erosion. Mechanical disturbance during vegetation management may cause declines in soil productivity, varying by type of activity and mitigation applied. However, mitigation and use of Best Management Practices (BMPs) can substantially reduce these declines.

- Compaction and organic matter removal are the two most important contributors to site degradation and loss of soil productivity.

- Standing and downed wood is a necessary component of ecosystem function and sustainability, and must be restored and preserved for soils to be productive.

- The levels of coarse woody debris (CWD) for Alternatives 4 and 6 are minimum levels needed to restore, maintain, and conserve soil productivity (as interims) until ecosystems are closer to desired range of future condition, based on Graham, Harvey, and Page-Dumroese's research (Graham et al. 1991).

- The higher the proportion of CWD retained in the larger diameter size classes, the more likely soil productivity, processes, and functions will be restored and conserved. Larger diameter wood has a more favorable moisture regime and slower decomposition rate to ensure sustainable nutrient supply, and is less likely to be consumed by fire than smaller pieces of wood.

- Removal of large wood (such as boles greater than 20 inches) and overall vegetation loss in riparian areas are significant contributors to loss of riparian soil function and declined water quality.

- Changes in natural vegetation composition, structure, and density have resulted in changes to soils properties.

- Stands that are within or trending toward the historical range of variability are more likely to have productive soils and have a sustainable supply of nutrients necessary for soil and site productivity.

Causes of the Effects of Each Alternative on Soils

- Road construction and related activities increase amount of bare soil or soil loss.

- Activities that remove organic matter, large tree boles, and coarse woody material below levels under which the soils for that site evolved can cause further decline in soil productivity and function.

- Retention of coarse wood on site will aid in restoration of soil productivity and nutrient cycling in areas where wood has been removed.

- Watershed and riparian restoration will benefit soil ecological function.

- Movement of vegetation toward or away from the historical range of variability influences ecological functioning of soils.

Methodology: How Effects on Soils were Estimated

Four main indicators of soil productivity and function were used:

- reduction in soil disturbance (change from current as compared to historical);

- levels of woody material retained on site (applicable to forested environments only);

- vegetation conditions representative of forest and rangeland structure and composition under which soils evolved; and

- watershed restoration and road closures that restore hydrologic and soil function.

Soil disturbance is displayed as reduction of soil disturbance for rangeland and forestland (as percent change from current compared to historical). Predicted trends in forest and rangeland vegetation conditions (movement toward or away from historical range of variability) were used to display the likelihood for nutrients to be available and sustainable through time. Riparian soil productivity and function also were evaluated.

The environmental consequences are based on information from the *Evaluation of Alternatives* (Quigley, Lee, and Arbelbide 1997) and from information provided by the soils expert panel and discussions with local scientists (J. Clayton, Soil Scientist, Intermountain Research Station; A. Harvey, Silviculturist, Intermountain Research Station; R. Graham, Intermountain Research Station; D. Page-Dumroese, Soil Scientist, Intermountain Research Station; D. Martens, Soil Scientist, Payette NF).

Effects of the Alternatives on Soil Productivity and Function

Effects on Soil Disturbance

Alternatives that propose greater soil disturbance would have a higher likelihood of impairing soil function and productivity. Acres of potential soil disturbance are displayed in Table 4-1. Soil loss, organic matter reduction or removal, loss of microbiotic crusts, decreased infiltration, and other degradation of soils could occur. The soil disturbance reduction indicator, used for both forestlands and rangelands, is based on the interrelationships of: 1) the amounts of different types of vegetation disturbance (wildfire, prescribed fire, timber harvest, timber thinning, exotic plant invasion, wild ungulate and livestock grazing, and range improvements); 2) the forest or rangeland potential vegetation group; 3) the kind of succession/disturbance regime (type and frequency of disturbance as influenced by vegetation resiliency); and 4) the management prescription models (CRBSUM) for the alternatives within the EIS planning area. Base values were derived from measured amounts of bare soil using plot data.

However, unvegetated or bare soil does not necessarily equate to actual soil disturbance. Actual soil disturbance can include erosion, compaction, puddling, and the like, and therefore is only represented by the use of the indicator. Reduction of soil disturbance is displayed in figures 4-1 and 4-2, as percent change from current compared to historical. This figure depicts the trend towards historical levels of soil disturbance from current.

In general, current levels of soil disturbance have resulted in declines of soil productivity and function. The greater the shift from current toward historical, the more likely the alternative would resemble natural soil disturbance levels and restore or maintain soil productivity and function. These values are

Table 4-1. Soil Disturbance Acres, UCRB Planning Area.

Potential Vegetation Group	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
				in thousands of acres			
Dry Forest	300	311	303	302	300	290	303
Moist Forest	424	360	324	296	331	289	305
Cold Forest	99	95	111	112	101	98	80
Forest Total	**823**	**769**	**738**	**710**	**732**	**677**	**688**
Cool Shrub		108	89	84	83	101	89
98							
Dry Grass	437	312	271	267	363	261	285
Dry Shrub	541	486	352	362	517	377	377
Riparian Shrub and Woodland	307	288	240	233	274	240	238
Range Total	**1393**	**1175**	**947**	**945**	**1255**	**927**	**998**
Woodland	9	7	7	7	8	7	6

Abbreviations used in this table:
PVG = potential vegetation group

Source: Adapted from in Quigley, Lee, and Arbelbide (1997).

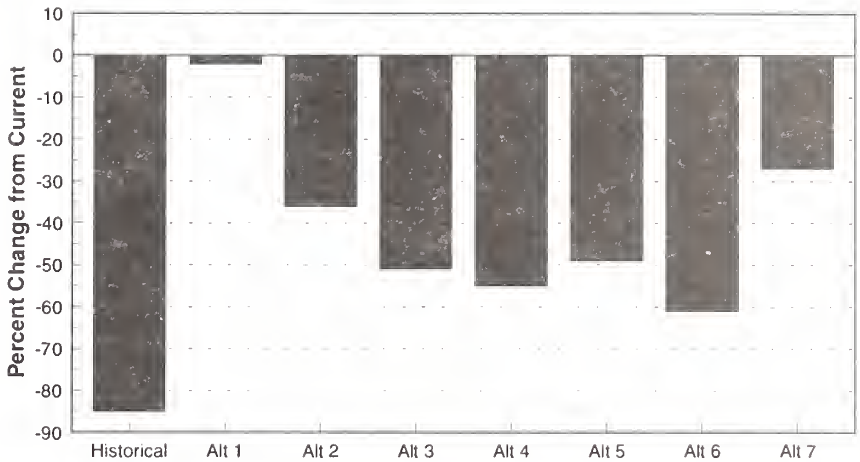


Figure 4-1. Changes in Forestland Soil Disturbance from Current.

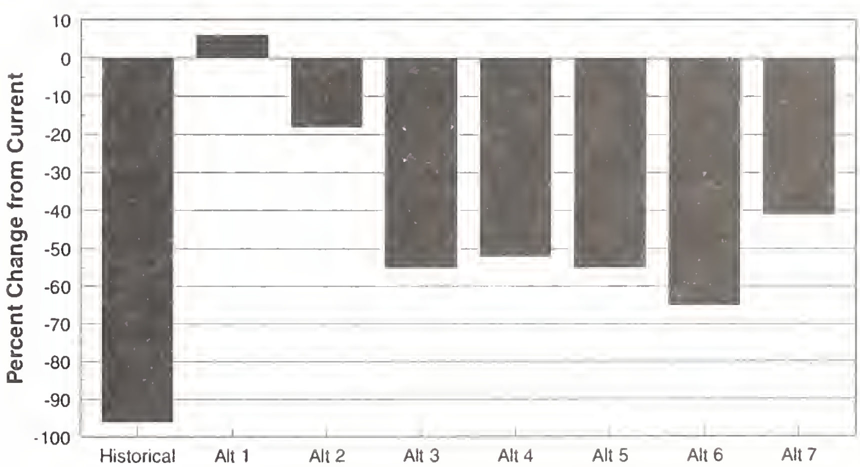


Figure 4-2. Changes in Rangeland Soil Disturbance from Current.

most useful as a relative comparison among alternatives for the long term. For further information on disturbances, assumptions, and methodology, refer to Hann et al. in Quigley, Lee, and Arbelbide 1997.

Not all disturbances have the same actual effect on soil productivity and function. For example, wildfire can reduce soil productivity, but unless all the organic matter, grass residue, needles, branches, and boles are consumed, loss of soil productivity may not be as high as it would be if soils were compacted and whole trees were removed from the site. Severe wildfire can result in water-repellent soil conditions, and increased soil erosion can occur if intense rainstorms also occur. Because of the mosaic pattern that wildfire produces, and the residual wood that is left on site, disturbance from wildfire usually has fewer implications for loss of soil productivity and function than disturbances which remove soil organic matter and decrease bulk density as well. Both water-repellent soil conditions and compacted soils can decrease soil functions (such as water infiltration, nutrient uptake, and biological activity) and can increase erosion, but the severity and longevity declining of soil productivity is generally greater under compacted soil conditions. Disturbance from roading activities also reduces soil productivity and function, and can comprise significant percentages of a watershed. This disturbance type was not incorporated into potential soil disturbance because data was not adequate at the broad scale, but it was evaluated through the watershed/road restoration indicator. Future disturbance from road construction and reconstruction was not quantitatively evaluated. It was qualitatively included based on EIS objectives and standards specifying that road construction and reconstruction avoid landscapes with high hazards for disruption of hydrologic processes.

Disturbances from grazing can be highly variable depending on the time of year, disturbance intensity, soil type, and other factors, but they generally are observed as a decrease in overall vegetation cover and change in plant composition and structure. The transition from perennial-plant-dominated communities to exotic-plant-dominated communities in the project area is partially a result of disturbances attributable to grazing. Although the science is limited with regard to exotic plants and soil productivity changes, there is evidence that the presence and persistence of exotic vegetation results in the loss of structural layering of above- and below-ground plant components. This simplification of above- and below-ground structural layering has a ripple effect in that it leads to a simplification of total diversity of organisms on site, which is suspected to lead to loss of microorganisms in the soil that are integral to normal functioning of the soil and the carbon and nutrient cycles; the end result is a suspected loss of soil productivity. Soil disturbance from grazing can include compaction of soils in areas of high use or on water-saturated soils, and disturbance from grazing and exotics can increase susceptibility of soil loss from wind and water erosion. The effect of the increased fire frequency on rangeland dominated by the exotic annual grasses cheatgrass and medusahead, is more frequent bare soil and greater susceptibility to erosive events.

Forestland

Alternative 6 proposes reduction of soil disturbance associated with projected management activities at a level most like historical soil disturbance. Alternatives 2 and 4 are similar and would reduce less soil disturbance than Alternative 6, followed by Alternative 5. Alternative 7, followed by Alternative 1, are least likely to reduce soil disturbance to historical levels (that is, have the least variation from current disturbance levels). Since Alternative 7 would have less active management, most of the disturbance is attributed to prescribed fire and wildfire, which have less of an impact on soil productivity than activities that remove whole trees and alter physical soil properties. Also, there is a high degree of uncertainty about how wildfire would occur across landscapes; therefore, Alternative 7 could result in a range from low to high reduction of soil disturbance, with a tendency toward high in the long term.

Rangeland

Alternative 6 proposes reduction of soil disturbance associated with projected management activities at a level most like historical soil disturbance. Alternatives 3 and 5 are similar, proposing less reduction than Alternative 6, followed by Alternative 4.

Alternative 7 is the least likely to reduce soil disturbance to historical levels (that is, soil disturbance would be the most similar to current levels of disturbance). However, there is a high degree of uncertainty about how exotic plant invasion and wildfire would occur across landscapes; therefore, Alternative 7 could result in a moderate to high reduction of soil disturbance, especially over the long term. Alternative 1 is likely to increase soil disturbance from current levels, largely due to increases in exotic plant invasion.

Levels of Woody Material

Work done by Graham et al. (1994) provides initial recommendations for managing coarse woody debris (CWD) for different forest types within the Rocky Mountains. Coarse woody debris is defined as any woody residue larger than three inches in diameter (Graham et al. 1994). Minimum amounts of coarse woody debris between 10 and 40 tons per acre for all forest types provide the highest overall likelihood that soil productivity can be restored and maintained (Graham, personal communication). These minimums are conservative interims until levels appropriate for the stand type and existing condition of the site can be determined locally (Harvey, personal communication). Additionally, where substantially more or less than 50 percent of total organic matter comes from sources of plant material less than three inches in diameter (such as grasses, litter, needles), these levels of coarse woody debris may be too low for restoration, maintenance, and conservation of soil productivity and function. Lower amounts have been measured on undisturbed sites and may be appropriate to protect and maintain soil productivity of some specific site types (Page-Dumroese, personal communication). Other research indicates that where soil organic matter has been lost, retention of woody material on the soil for one to two years prior to fire, can significantly increase soil organic matter levels and enhance soil productivity.

Loss of soil organic matter and coarse wood was a condition identified by the science team as a major cause of decreased and degraded soil productivity, which is pervasive across the ICBEMP. Declining soil productivity tends to be highest where past management has been the most intensive and extensive. Organic matter removal is one of the most important contributors to site degradation. Where organic matter levels, both in amount and size distribution, can be restored and conserved, soil productivity has the highest likelihood of sustainability. Downed bole wood is an integral constituent of many forest ecosystems because it serves a multi-functional role in carbon and nutrient cycling, habitat availability, stream channel morphology, and natural wildfire. While it is well known that large amounts of downed wood accumulate where temperatures are mild and precipitation is abundant, large quantities can also accumulate in drier ecosystems in response to natural disturbance. High levels of fuels buildup in dry climates can increase the spread and intensity of wildfire. Downed boles are not a significant factor in the behavior of wildfire. However, their consumption under dry moisture conditions can prolong fire duration and can increase the temperature and depth of soil heating, thereby causing volatilization of soil carbon and nutrients. Implicit in all discussions of downed boles is their potential to augment nutrient and carbon storage and therefore long-term productivity. The release of nutrients, carbon, and moisture retention from decaying wood is essential for maintaining the fertility of forest soils (Page-Dumroese 1996).

Alternatives 4 and 6 would have a high likelihood of restoring and maintaining organic matter levels necessary for soil productivity and function because of the interim levels of coarse woody debris and the levels of standing and downed large trees required on disturbed and undisturbed sites. Alternatives 3, 5, and 7 (outside reserves) are less likely to restore and maintain organic matter levels based on the above guidelines and associated research. Alternatives 1 and 2 would have no required coarse woody debris levels; therefore the effects are unknown.

Other data from research publication of photo series for quantifying forest residues and downed woody fuels (Fisher 1981, Maxwell and Ward 1980) indicate that the minimum interim levels of coarse woody debris in Alternatives 4, 6, and 7 may be higher than levels found in natural conditions for certain forest types, especially in dry forest types. The photo series guides were developed to determine fuel levels in different vegetation types for aid in fuel inventory and design of prescribed fire treatments; some of the sites are representative

of conditions with natural frequencies of fire disturbance. The minimum interim levels of coarse woody debris in Alternatives 3 and 5 are based on this research. These data suggest that the minimum interim levels in Alternatives 4, 6, and 7 may pose a wildfire risk in some situations.

The importance of woody material is applicable to rangeland environments as well as forested environments. This is particularly true in range shrub systems, where availability of woody material is a major component of nutrient and carbon availability and cycling.

Further analysis is needed regarding the retention and recruitment of woody material, especially coarse wood, to maintain and restore soil productivity and its interaction and relationship to fire. These interactions are of concern for all forest vegetation types, particularly dry forests where fire frequencies have been extended and where large trees have been removed. There is also a concern for protection, as dry forests are often the closest forest settings to wildland/urban interface areas and Federal/private interface areas. Some of the questions that need to be addressed include the following: What levels can be sustained without limiting the use of prescribed fire and increasing total fuel loadings on these sites? Are there places where potential fire intensities present a greater risk to the ecosystem than to decreased soil function?

These questions will be addressed and recommendations for evaluating the relationships and interactions of coarse wood and fire in various soil and vegetation types will be developed. This work will be done by experts in forest soil productivity and fire ecology from throughout the project area between release of the UCRB and Eastside Draft EISs and completion of the Final EISs.

Vegetation Conditions Trending Towards Historical Range of Variability

Forestland

Work by Clayton (1995) has shown that ponderosa pine stands outside historical range of variability contain disproportionately larger amounts of foliage, small branches, and litter when compared to mature open stands. This research suggests there has likely been a net redistribution of nitrogen and other nutrients from the soil to the above-ground vegetation. Based on these conclusions, stands outside of historical range of variability are more vulnerable than stands within the historical range to accelerated nutrient loss from management activities or wildfire.

This requires increased considerations for retention of wood on site, brush disposal prescriptions following harvest or thinning, and residence time for wood to incorporate into the soil prior to prescribed fire.

Activities that set vegetation structure on a trend toward historical range of variability, if carried out without having a net negative impact on soils, are more likely to maintain a stable and available nutrient supply and thus sustain soil productivity and reduce risk of nutrient loss from uncharacteristic fire.

As indicated in table 4-2, Alternatives 3, 4, and 6 would be most aggressive in changing terrestrial communities toward historical range of variability, while minimizing change away from historical range of variability.

Rangeland

Research has shown that soil morphological characteristics such as thickness of soil horizons, nutrient holding capacity, and depth and amount of organic matter, are useful indicators of site productivity (Munn et al. 1978). For example, in rangeland and prairie soils, thickness of the soil organic layer alone can be used to predict long-term production of vegetation. Thickness of this layer is largely determined by depth and amount of root growth by grasses (Cannon and Nielsen 1984). This research along with study of soil genesis and evolution under prairie conditions suggest that loss of the deep rooted component of native vegetation has implications for soil productivity and function. Based on these findings and a similar train of logic to that of work done in forested environments, it is assumed that rangeland vegetation closer to historical range of variability and native vegetation communities provides the highest certainty of sustainable soil productivity. In addition, reduction in the spread of exotic vegetation (as defined in the Landscape STAR 1996) is also expected to improve soil productivity and function.

Table 4-2. Trends in Forest Vegetation, UCRB Planning Area.

	Alt 1		Alt 2		Alt 3		Alt 4		Alt 5		Alt 6		Alt 7	
	10yr	100yr	10yr	100yr	10yr	100yr	10yr	100yr	10yr	100yr	10yr	100yr	10yr	100yr
Lower Montane (Dry Forest)														
early	++	++	++	++	++	++	++	++	++	++	++	++	++	++
mid	0	--	0	--	++	++	++	++	++	-	++	-	0	0
late multi	0	-	0	-	0	0	0	0	0	0	0	0	0	-
late single	00	+	00	+	+	++	+	++	+	++	+	++	00	+
Montane (Dry and Moist Forests)														
early	0	0	0	0	0	0	0	0	0	0	0	0	0	0
mid	+	++	+	++	+	++	+	++	+	++	+	++	+	++
late multi	+	++	++	++	+	++	+	++	+	++	+	++	++	++
late single	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subalpine (Moist and Cold Forests)														
early	0	0	0	0	0	0	0	0	0	0	0	0	0	0
mid	0	0	0	0	0	-	0	-	0	-	0	0	-	++
late multi	++	++	++	++	++	++	++	++	++	++	++	++	++	++
late single	0	0	0	0	0	0	0	0	0	0	0	0	0	0

This table shows trends in Forest vegetation in 10 years and 100 years relative to the historical range of variability for lands administered by either the Forest Service or the BLM in the UCRB planning area.

Currently within HRV: moves out (-); no change (0)
Currently outside HRV: moves in (++) ; moves farther out (--); moves toward (+); no change (00)

Abbreviations used in this table:
HRV = historical range of variability

Source: Adapted from in Quigley, Lee, and Arbelbide (1997).

Based on the noxious weeds and cheatgrass evaluation of alternatives (Karl 1996, in Quigley, Lee, and Arbelbide 1997), the trends in exotic vegetation were modified. Negative trends reflect ranks in Karl (1996, in Quigley, Lee, and Arbelbide 1997) that show that rangeland PVGs, as a whole, would continue to be infested with noxious weeds and cheatgrass. Positive trends reflect ranks that show that the alternative is expected to result in prevention of further spread of noxious weeds and cheatgrass and some reclaiming of the rangeland PVGs, as a whole.

As indicated in table 4-3, Alternative 7 would have the greatest movement of terrestrial communities toward historical range of variability. Alternatives 1, 3, 4, 5, and 6 would provide the same, but slightly less movement toward historical range of variability than Alternative 7, while moving some of the upland woodland out of historical range of variability. The positive trends are across the upland herbland, while upland shrubland remains stable. Alternatives 3, 4, 6, and 7 would provide the most reduction in spread of exotics. Alternatives 3 and 4 would provide a high likelihood that rangeland soil productivity can be sustained, with Alternatives 3 and 4 being the highest.

Watershed Restoration and Road Closures that Restore Soil and Hydrologic Function

Restoration activity that restores soil properties and the soils' ability to absorb, store, and release water, as well as to provide a healthy medium for plant growth, would aid in the restoration and sustainability of soil productivity. Since roads result in organic matter and mineral soil loss and alter hydrologic networks and patterns, road closure that restores soil and hydrologic function would provide substantial benefits to the soil resource.

Forestland

Alternatives 4, 6, and 7 would provide the highest levels of road restoration. Because Alternative 7 takes a more passive approach to restoration, it is anticipated that the majority of road closures would not be directed at soil and

Table 4-3. Trends in Rangeland Vegetation, UCRB Planning Area.

	Alt 1		Alt 2		Alt3		Alt 4		Alt 5		Alt 6		Alt 7	
	10yr	100yr	10yr	100yr	10yr	100yr	10yr	100yr	10yr	100yr	10yr	100yr	10yr	100yr
Exotics	--	--	--	--	+	+	+	+	--	--	--	--	--	--
Upland herbland	++	++	++	0	++	++	++	++	++	++	++	++	++	++
Upland shrubland	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Upland woodland	+	-	+	--	+	--	+	--	+	--	+	--	+	++

This table shows trends in Rangeland vegetation in 10 years and 100 years relative to the historical range of variability for lands administered by either the Forest Service or the BLM in the UCRB planning area.

Currently within HRV: moves out (-); no change (0)
Currently outside HRV: moves in (++) ; moves farther out (--); moves toward (+); no change (00)

Abbreviations used in this table:
HRV = historical range of variability
Source: Adapted from Quigley, Lee, and Arbelbide (1997).

hydrologic function, and therefore in the short term may present a higher risk to soil and hydrologic function than if they remained open.

Rangeland

Alternatives 4 and 7 would provide the highest levels of road restoration in rangeland environments, and Alternative 6 would provide the next highest level. Alternative 7 may increase short-term risks where roads in sensitive landscapes are not actively restored.

Alternatives 1, 2, 3, and 5 propose the same level of road closure, which are substantially lower than Alternatives 4, 6, and 7.

Cumulative Effects on Soil Productivity

Alternatives 4 and 6 would have the highest likelihood of restoring, conserving, and maintaining soil productivity and function in forest environments; Alternatives 3, 4, and 6 are highest in rangeland environments. This is because soil disturbance would be lowest, coarse and standing wood levels are considered to be adequate in forested environments, there would be high movement of vegetation conditions toward historical range of variability, and there would be high levels of watershed and road restoration. Alternative 6 would have less soil disturbance than Alternative 4, but Alternative 4 would have higher watershed and road restoration. Alternative 7 could also be fairly high in restoration and protection of soil productivity, because of the combined benefits of woody material on site and uncertainty of soil disturbance levels, but this alternative does not move vegetation conditions toward historical range of variability as well as Alternatives 3, 4, and (except in rangelands). Alternatives 3, 4, 6, and 7 also provide the greatest reduction in exotics in rangelands. Also, the risks of road-related effects from lack of active restoration in Alternative 7 could outweigh the benefits, at least in the short term. Alternative 7 would have the least amount of potential soils disturbance in rangeland riparian areas. Alternatives 1 and 2 would be the least likely to restore, maintain, and protect soil productivity and function in both forestlands and rangelands. This is because of the lack of watershed and road restoration, vegetation movement towards historical range of variability is slow, soil disturbance is minimally reduced, and there are no required minimum levels of coarse wood in forestlands.

Air Quality

Assumptions

Visuals and Smoke

The following assumptions were made by the EIS Team:

- ◆Wildfires and prescribed fires do not occur evenly spaced throughout the year, but rather occur in a pattern more likely defined as episodes:
  - ◆For wildfires, a combination of weather conditions and ignition sources (usually lightning) needs to occur. When weather associated with intense fire behavior and multiple ignitions occurs, the result can be multiple large fires. These large fires result in the majority of all acres burned due to wildfire.
  - ◆In the case of management-ignited prescribed fire, weather is a primary factor in determining if an area can be burned under conditions that will meet the objectives of the fire. When the weather conditions become favorable for prescribed burning, the area affected is usually large, resulting in episodes in which large amounts of prescribed fire are occurring.
- ◆For modeling purposes, we can select representative weather conditions in early spring, late spring, and fall when prescribed fire would occur.
- ◆For modeling purposes, we can select representative weather conditions in summer when an active wildfire would occur.

Other Pollutants

The following major assumptions were made by the Science Integration Team during their evaluation of alternatives:

- ◆Most air pollutants that affect the BLM- and Forest Service-administered lands come from industrial or agricultural sources, or auto emissions off public lands.
- ◆Management of BLM- and Forest Service-administered lands can reduce potential effects of both air pollutants and climate change by reducing stress on biotic communities (plants and animals) through managing to promote landscape health and diverse native species.

Summary of Key Effects and Conclusions

- ◆The dispersion modeling assessment indicates that there may be significantly greater impacts from wildfires than from prescribed burning. However, due to limitations of this analysis, comparison of the model estimates with the National Ambient Air Quality Standards is not possible. Compliance of prescribed burning impacts with the National Ambient Air Quality Standards should be evaluated at a subsequent planning level.
- ◆Increased haziness (a reduction in viewing distance and ability to detect finer features on the landscape) would likely result from the increases in prescribed burning proposed in Alternative 3 through 7. Large wildfires result in more of the project area affected by haze. It can be inferred that the higher concentrations of emissions associated with these wildfires would reduce visibility in affected areas more so than the highest levels of prescribed fire. However, a higher frequency of visibility impacts would result from prescribed fire than wildfire.
- ◆Other criteria pollutants are not likely to have an impact on public health because of the small levels produced and the rapid dilution or modification of these substances within relatively short time frames. However, the potential effects of air pollutants impacting plants and animals on public lands could be mitigated by managing to minimize stress and through monitoring. The effects of alternatives on landscape health provide an indicator for reducing stress on plant and animal habitats with Alternatives 3, 4, 6, and 7 having the greatest ability, and Alternatives 1, 2, and 3 providing almost no improvement in landscape health that would reduce stress. Monitoring and prediction of potential effects with feedback to the EPA would be best addressed under Alternatives 6, 4, and 3 respectively, with 7 and 5 at moderate levels, and 2 and 1 at the lowest levels.

- ◆Information from monitoring pollutant deposition and effects on BLM- and Forest Service-administered lands can be used to reduce potential for pollutants and to improve the prediction capability of source/ receptor relationships through the Clean Air process.

Causes of the Effects of Each Alternative on Air Quality

- ◆Wildland fires, both wildfire and management-ignited prescribed fire, affect air quality.

- ◆The impacts of wildfire and management-ignited prescribed fire on air quality vary because of the differences in distribution of acres burned, the amount of fuel consumed per acre (due to fuel moisture differences), and the typical weather conditions in which spring and fall prescribed fires occur.

Methodology: How Effects on Air Quality were Estimated

A model was used to assess the impacts of wildfire and management-ignited prescribed fire smoke on air quality within the interior Columbia Basin. Estimates were made of the effects of particulate matter emitted from recent wildfires on health standards and visibility, and from a range of management-ignited prescribed fire that could result from the land management alternatives under consideration for the EIS.

Wildfires and prescribed fires are compared because of the belief that aggressive fuel treatment can significantly reduce the likelihood of large damaging wildfires, and because prescribed fire is proposed as a major fuel treatment alternative in the project area. The belief that fuel treatment can reduce the impacts of wildfires has been common among fire managers for years, has been witnessed in the field, and has been demonstrated by a study completed in northeast Oregon (Schaaf 1996).

The dispersion model used to assess the effects of wildland fire on air quality was planned before the alternatives were formulated. When the contract for the analysis was awarded, the prescribed fire activity levels associated with each alternative had not yet been determined, although it was assumed that it would likely be more than current levels. Therefore, prescribed fire scenarios that contained estimates of current types and levels of prescribed fire activity and increments of additional burning were modeled. Wildfire scenarios were based on daily acres burned in actual wildfire occurrence scenarios. Analysis of specific levels of prescribed fire proposed in each alternative could not be conducted.

A set of four meteorological databases was constructed by integrating terrain with actual atmospheric conditions experienced during five- to eight-day time periods in 1990 (EPA unpublished). These episodes represented typical weather and smoke dispersion conditions for the spring and fall prescribed fire season and for summer wildfires. The databases included wind fields and other meteorological information that affect smoke dispersion. The episodes were:

- ◆An early spring episode (March 27 through 31) representing typical prescribed burning conditions in the southern part of the Columbia River Basin below the 46th parallel.

- ◆A late spring episode (May 4 through 11) representing prescribed burning conditions in the northern part of the Columbia River Basin above the 46th parallel.

- ◆A summer episode (August 6 through 13) during which a large number of wildfire acres burned.

- ◆A fall episode (October 14 through 19) representing fall burning conditions for both the northern and southern parts of the Columbia River Basin.

Prescribed Fire Scenarios

For the analysis of spring and fall prescribed fire smoke, eight different emission scenarios were evaluated — a base level representing current prescribed fire activities plus additional increments of prescribed burning. The estimate of a base level to represent current prescribed fire was made from a count of all the management-ignited prescribed fires in 1990 from Forest Service and Bureau of Land

Management units in the project area. Although accurate locations and vegetation types burned were generally unavailable, previous work (Peterson 1992) estimated the proportion of all prescribed fires that occur in each of four general vegetation types (mixed conifer, ponderosa pine, shrub/grass, and grass) in spring and fall (table 4-4.) The baseline prescribed fires were allocated to these four vegetation types according to the proportions estimated by Peterson (ibid). Using the Geographic Information System (GIS), fires were placed on the landscape by randomly selecting locations of the assigned vegetation type. The efficiency of combustion and hence the amount of smoke produced is characteristically different for pile burns, underburns, and broadcast burns. Every prescribed fire was therefore coded to one of these three fire types according to the proportion of each of these fire types that typically occurs. The fuel loading (volume of downed woody material by size classes, litter, and duff) used for the four vegetation types represented average loadings (Huff et al. 1995).

For the spring and fall prescribed fire meteorological databases, eight different emission scenarios were evaluated — a base level (current levels) of prescribed fire plus additional increments of fire. The base level of prescribed fire models the amount and distribution of fire among fire types and cover types that represent peak levels of weekly prescribed fire activity during early spring, late spring, and fall of 1990. The base scenarios that characterize each period include the number of burned units, unit sizes, vegetation types, and fire types (underburns, broadcast burns, and pile burns). In each of the two base spring scenarios, 1,586 prescribed fire acres were modeled; for the base fall prescribed burning period, 13,883 acres were modeled. Additional modeled scenarios increased increments of prescribed fire up to 16 times the acreage of prescribed fire estimated to burn currently (see table 4-9 for a list of scenarios). Sixteen times current spring acreage is approximately 25,400 acres in a six-day period within the ICBEMP area, while for the fall burning period, 16 times current acreage is 222,000 acres.

Wildfire Scenarios

For the summer weather period, nine wildfire scenarios were developed, based on an estimate of daily acreage and types of fuels burned by wildfires during the period August 8 through 13, 1990; July 27 through August 3, 1994; and August 20 through 27, 1994. In addition, emissions were calculated for these wildfire scenarios assuming that only 50 percent and 25 percent of the actual acres burned, in order to estimate air quality impacts for less active wildfire periods. Data on location, size, and acres burned per day for fires on all ownership (Federal and State) were obtained from records kept at the National Interagency Coordination Center (daily "incident management situation reports"). Only those wildfires 100 acres and larger were used in this analysis because these larger fires make up the vast majority of the wildfire acres burned. Based on best

Table 4-4. Percentage of Prescribed Fires, Project Area.

Vegetation Type	Spring Prescribed Fire	Fall Prescribed Fire
	percent	
Grass	13	1
Shrub	19	8
Ponderosa Pine	5	7
Mixed Conifer	62	84

This table shows the estimated percentage of prescribed fire for four general vegetation types for the project area.

Source: Huff et al. (1995).

information about location and plant community in which the wildfires occurred, each fire was classified as one of the four vegetation types (mixed conifer, ponderosa pine, shrub/grass, and grass). The origin of the fire was used to place the fire for modeling purposes, and acres burned per day were used to calculate emissions. Cumulative impacts of emissions were modeled for the eight days of meteorological data.

Use of Models

The modeling domain covers an area that is about 800 miles by 660 miles. This area includes all of the Columbia River Basin and an appropriate buffer zone around the edges of the area of interest to allow the consideration of recirculating wind flows and boundary effects. The area was divided into 3,445 cells, each about 154 square miles (400 square km). Particulate levels and changes in visibility were estimated for each of the grid cells.

Particulate emissions and heat release rates were calculated for each prescribed fire and wildfire source, using the Emissions Production Model (Sandberg and Peterson 1985). CALPUFF, an advanced Lagrangian puff model (Scire et al. 1995), was used to produce estimates of ambient concentrations of particulate matter smaller than 10 microns (PM_{10}), estimates of particulate matter less than 2.5 microns ($PM_{2.5}$), and estimates of related visibility impacts. The concentration estimates were averaged over 24 hours to correspond to the averaging timber of the National Ambient Air Quality Standards (NAAQS) and prevention of Significant Deterioration (PSD) Increments for PM_{10} developed under the Clean Air Act. The 24-hour NAAQS for PM_{10} is 150 micrograms per cubic meter ($\mu g/m^3$). A NAAQS for $PM_{2.5}$ has not been established, however a value of approximately 60 ($\mu g/m^3$) is under consideration. To evaluate the air quality impacts of the prescribed burning and wildfire emissions, threshold values equivalent to these two concentrations were employed, not to serve as an assessment of compliance with the NAAQS, but to provide an indication of whether or not the forest and rangeland burning emissions by themselves may be expected to lead to widespread, regional-scale exceedances of the NAAQS. As described in the section below on limitations to the modeling, model predictions are not cumulative impacts of all sources, and, therefore, this comparison does not constitute an appropriate evaluation of NAAQS impacts.

Model outputs included maps showing 24-hour average concentrations of particulate for each scenario. Tables for each prescribed fire and wildfire scenario (tables 4-6 through 4-11) depict the number of grid cells that exceed Clean Air Act standards for PM_{10}, or 150 micrograms per cubic meter (150 $\mu g/m^3$). Although there is no currently established standard for $PM_{2.5}$, tables were developed showing number of grid cells that exceed an assumed threshold of 60 micrograms per cubic meter (60 $\mu g/m^3$). Caution must be used in interpreting these data, since the background level of particulate matter was not included because of its significant variation within the project area. However, sources for most background particulate are blowing dust and winter wood stove smoke, which are present when there is little prescribed fire activity.

Effects on visibility resulting from smoke production by the various scenarios were assessed using a haziness index, expressed in deciviews (Pitchford and Malm 1994). A change in one deciview corresponds to an approximate 10 percent change in the light extinction coefficient, which is considered a small, but perceptible decrease in visibility. When considering the impacts of smoke production upon visibility, it should be noted that in areas where the air is clean and visibility is good, a relatively small amount of smoke can be perceptible. If an area has relatively poor visibility, a greater amount of smoke is required to create a perceptible change.

Assessing the impacts of a range of land management alternatives on air quality is a complex matter, particularly when performed for an area as large as the interior Columbia River Basin. This is the first programmatic EIS to attempt quantitative evaluation of the impacts of prescribed burning and wildfire emissions on air quality. At most, other analyses of this scope have estimated aggregate emissions resulting from different land treatments. For this assessment, emissions input were derived from recently developed databases on vegetation types and emissions, and actual wildfire data and smoke management information. The air quality dispersion model used in this analysis,

CALPUFF, has been recommended for regional-scale analysis by the Interagency Work Group on Air Quality Modeling. (The Interagency Work Group on Air Quality Modeling is composed of representatives from the Environmental Protection Agency, the Forest Service, the National Park Service, and the Fish and Wildlife Service. Composed of air modeling experts, the Interagency work Group was formed to review, identify, and recommend candidate air quality simulation modeling techniques that can be used to estimate pollutant concentrations over long transport distances. The Phase I recommendations of the Group recommended the use of the MESOPUFF II model. The Phase II recommendations [currently under development] are expected to recommend the use of CALPUFF.) CALPUFF was selected for its capabilities to simulate temporally and spatially varying emissions and meteorological conditions, features that make it superior to more commonly used regulatory models. With these features, CALPUFF has the potential to more realistically simulate complex wind flows associated with the mountainous terrain of the project area. Furthermore, CALPUFF was recently modified to include new algorithms for simulating multiple buoyant air sources, which are intended to provide a realistic characterization of the types of sources associated with forest and rangeland burning.

To understand the significance and proper application of the results of these modeling analyses, it is essential to note the limitations of the analysis conducted. CALPUFF's sensitivity and performance have not been evaluated, and the accuracy and potential biases of the model relative to its application to forestry burning sources are unknown. Because no thorough model evaluation has been conducted, the results from this modeling exercise are expected to be less reliable than those developed in typical regulatory evaluations of National Ambient Air Quality Standards attainment. Care should be taken when comparing these modeling results with those conducted for evaluating non-attainment areas. Standard particulate matter National Ambient Air Quality Standards modeling for non-attainment areas employs worst-case assumptions to provide certainty that health based standards will not be violated.

This modeling analysis evaluated impacts of wildfires and management-ignited prescribed fires on a regional scale. Use of a fairly coarse, 20 kilometer receptor grid was required to provide coverage over the entire project area. Because the coarse grid analysis could not define local-scale maximum air quality impacts, it was intended that a fine-scale analysis using a 100 meter receptor grid also be conducted. However, resource limitations prevented the completion of an adequate fine-scale analysis. While this regional approach is appropriate for a programmatic EIS, it cannot be used to assess impacts of burning on attaining the NAAQS at any individual location.

The quality of ambient air is defined by the cumulative effect of all sources, but this analysis did not evaluate the sources of particulate pollution other than prescribed fire and wildfire. The impacts from stationary sources like factories and pulp mills and major area sources such as automobiles were not included. Cumulative impact estimates could not be made, and the question of NAAQS attainment could not be answered at this regional scale. This analysis does suggest that wildfire impacts are significantly greater in magnitude than prescribed burning impacts, although the relative frequency of such impacts was not modeled.

The general approach used in constructing this air quality impact assessment was to portray typical, as opposed to worst-case, air quality impacts from various levels of prescribed fire and wildfire. The modeling effort used meteorological data that was representative of the prescribed fire and wildfire season. Had worst-case dispersion conditions been used in the model, much higher air quality impacts would likely have resulted.

The emission rates for understory burns were estimated with the Emissions Production Model (EPM). This model was developed by the Forest Service to predict particulate emissions from pile and broadcast burning of harvest residues, not from understory burning. While the application of EPM to understory burning introduces additional uncertainty to the analysis, experts believe the Emissions Production Model should not necessarily be biased in this application, and it therefore is the best tool available for estimating emissions from understory burning. (Research is currently underway to develop an improved technical basis for applying EPM to a wider

range of prescribed fire types, including understory burning.)

The analysis assumed that prescribed fires are ignited at 11:00 am, which results in the release of the bulk of the emissions during the unstable daytime hours when vertical mixing is enhanced and the smoke plume is likely to be dilute relatively quickly. Some prescribed fires are active during the stable nighttime hours and have the potential to produce higher ground level impacts due to lower plume heights and less favorable dispersion conditions. It was also assumed that the size of the source area is equal to the acreage burned, which may tend to overestimate the local dilution of pollutants, particularly during the early portion of the fire. It is thus possible that this analysis underestimates the amount of particulate matter and subsequent air quality impacts associated with each prescribed burning scenario.

Smoke and effect on visuals were evaluated in the *Evaluation of Alternatives*. Similar methods were used for comparison of wildfire and prescribed fire scenarios. In addition, the CRBSUM model was used to compare overall levels of smoke production.

Effects of the Alternatives on Air Quality

Prescribed fire is the only planned action that would affect air quality at the broad scale. When wildfires occur, visibility would decrease substantially more than during prescribed burning. However, prescribed burning would affect air quality more frequently. In the long term, wildfires may decrease in frequency for alternatives which implement high levels of prescribed burning. Results of the analysis of prescribed fire are compared to the effects of wildfire on air quality. The effects of the alternatives on two different aspects of air quality were assessed — effects on the amount of particulate matter released (a component of the National Ambient Air Quality Standard [NAAQS]), and the effects of the alternatives on visibility. Results presented are for the entire ICBEMP area.

The midpoint of the total amount of prescribed fire proposed for each alternative in tables 3-6 and 3-7, were compared to the level of prescribed fire in Alternative 1, no-action (table 4-5).

The level of management-ignited prescribed fire would be highest in Alternative 4. The ratio of prescribed fire in Alternative 4 to current levels is 3.05. The prescribed fire scenarios that were modeled are for individual weeks of representative activity, but they include increments up to 16 times current levels. Because the highest level in any alternative is only three times current levels, we can assume that the smoke modeling that was conducted likely encompasses the highest level of management-ignited prescribed fire.

Criteria Pollutants

Ozone and carbon monoxide are criteria pollutants also produced by wildland fire. Ozone is a byproduct of prescribed burning, but these fires are generally spatially and temporally dispersed, so potential ozone exposures from prescribed fire are infrequent (Sandberg and Dost 1990). Carbon monoxide is rapidly diluted at short distances from a prescribed burn and poses little or no risk to community health (Sandberg and Dost 1990). Other non-criteria, but potentially toxic, pollutants are emitted by prescribed burning.

Effects of other pollutants were evaluated based on the review in the *Landscape Ecology* chapter of the *Assessment of Ecosystem Components*, correlation with landscape health, and emphasis on monitoring and prediction. In particular, alternatives that would provide management emphasis on a diversity of habitats and species which would be less susceptible as a biotic community to air pollutant effects were given higher ratings.

Predicted Air Quality Impacts

The modeling conducted for this analysis was intended to compare the regional impacts of different land management practices over millions of acres of land. The size of the area of concern and the scope of the programmatic changes discussed in this EIS dictate the use of a large modeling domain and a relatively coarse grid of receptors where impacts are estimated. Because many air quality impacts, such as compliance with the NAAQS, are predominately determined by localized conditions, a modeling analysis used to evaluate programmatic

Table 4-5. Prescribed Burning Activity, Project Area.

	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Ratio (Alt X: Alt 1)	1.0	2.25	3.05	1.82	2.73	1.81

Source: Chapter 3 Tables 3-6 and 3-7.

changes cannot really answer whether NAAQS will be attained or violated. At best, analysis at this level can give a general assessment of relative impacts from prescribed burning and wildfires, by alternative.

None of the 154 sq. mile grid cells exceeded threshold values (150 $\mu g/m^3$) for 24-hour averages of PM_{10} concentrations in any of the prescribed fire scenarios. None of the prescribed fire scenarios exceeded the assumed threshold of 60 $\mu g/m^3$ for $PM_{2.5}$. However, the wildfire scenarios estimated concentrations above both of these threshold values.

The predicted number of cells that exceed the PM_{10} threshold are shown in table 4-6 for the three wildfire scenarios, based on actual occurrence during July 27 through August 3, 1994. Emissions based on actual acres burned (100 percent of acres burned) had 190 grid cells that exceed the PM_{10} threshold value, the highest number of grid cells with PM_{10} violations of any of the three wildfire episodes. When the levels of wildfire activity were reduced, the number of grid cells that exceeded the PM_{10} threshold also decreased. For a wildfire scenario based on 50 percent of actual acres burned, 45 grid cells exceeded the selected threshold. When the wildfire activity level considered was reduced to 25 percent of the actual acres burned, 4 grid cells exceeded the threshold (table 4-6).

The wildfire scenario based on the actual location and acres burned in the period August 6 through 13, 1990 (table 4-7) resulted in 443 grid cells for actual acres burned that exceeded the $PM_{2.5}$ threshold, the greatest number of any of the three scenarios. When it is assumed that only 50 percent and 25 percent of the actual acres burned, the 60 $\mu g/m^3$ threshold is exceeded for 207 and 83 grid cells, accordingly.

All three levels of simulated wildfire activity (100 percent, 50 percent, and 25 percent) for the third wildfire scenario, based on the location and daily acreage burned for the period August 20 through 27, 1994, also produced at least some days for which particulate levels exceeded the selected threshold. This threshold value was exceeded in 81, 13, and 3 grid cells for the 100 percent, 50 percent, and 25 percent simulations of actual acres burned, respectively.

The predicted concentrations of particulate matter for the prescribed fire scenarios are substantially lower than the wildfire scenarios for several reasons: (1) higher fuel moisture levels during management ignited prescribed fires compared to wildfires generally result in less fuel consumed per acre of prescribed fire than per acre of wildfire; (2) smoke dispersion conditions during the spring and fall prescribed burn episodes are better; and (3) prescribed fires are dispersed across the landscape, rather than being concentrated in a few locations. Although a compensating factor is the larger buoyancy and potentially higher plume rise of the wildfire plumes compared to the smaller prescribed fire plumes, the wildfire plumes eventually mix down to the ground and result in higher ground-level concentrations of particulate matter.

Visibility

The number of grid cells where the increase in haziness (decrease in visibility) exceeded one deciview (a 10 percent change equals 1 deciview) was computed for each simulation. Tables 4-8, 4-9, and 4-10 show the number of grid cells (of the total 3,445) with impaired visibility for each prescribed fire scenario, March, May, and October. The average values show that the visibility impairment is fairly equivalent between the March and May

Table 4-6. Summer Wildfires Scenarios 7/27 through 8/3/94, Project Area.

Acres Burned	Number of Grid Cells with PM_{10} Concentrations Above 150 $\mu g/m^3$								
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
Actual	1	1	12	55	56	29	26	10	190
50% of Actual	0	0	4	20	16	0	5	0	45
25% of Actual	0	0	0	1	3	0	0	0	4

Abbreviations Used in this Table:
PM_{10} - Particulate matter less than 10 microns.
$\mu g/m^3$ - Micro grams per cubic meter.

Source: Scire and Tino (1996).

scenarios (tables 4-8 and 4-9), while the October scenario (table 4-10) has much greater loss of visibility. The greatest visibility impairment for the three-times-current-level scenario which approximates Alternative 4, is 355 grid cells, or about 10.3 percent of the total on a single day of the October prescribed fire scenario (table 4-10).

Table 4-11 displays the number of grid cells in which visibility decreased by at least one deciview for the nine wildfire simulations. Even the lowest levels of acreage of the three scenarios (25 percent of actual) show a higher average visibility impairment than three times the current level of prescribed fire. The average area with decreased visibility using actual wildfire acreage for the three wildfire episodes exceeds the 16-times-current levels of prescribed burning activity in the March, May, and October prescribed fire simulations. However, visibility impacts from prescribed fire are expected to occur more frequently than visibility impacts from wildfire, because the number and size of wildfires varies considerably among years, while prescribed fire activities occur almost every year, during early to late spring, and in the fall.

Table 4-7. Summer Wildfires Scenarios 8/6 through 8/13/94, Project Area.

Acres Burned	Number of Grid Cells with PM_{10} Concentrations Above 150 $\mu g/m^3$								
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
Actual	0	0	5	41	65	130	157	45	443
50% of Actual	0	0	2	4	24	75	100	2	207
25% of Actual	0	0	1	2	9	42	29	0	83

Abbreviations Used in this Table:
PM_{10} - Particulate matter less than 10 microns.
$\mu g/m^3$ - Micro grams per cubic meter.

Source: Scire and Tino (1996).

Table 4-8. March Prescribed Burn Scenarios, Project Area.

Amount of Prescribed Fire	Number of Grid Cells with Perceptibly Decreased Visibility 3/27	3/28	3/29	3/30	3/31	Average
Current level	21	17	17	5	12	14
2 times current	21	33	27	16	20	23
3 times current[1]	28	38	59	46	28	40
4 times current	46	42	64	37	44	47
6 times current	46	65	72	42	51	55
8.5 times current	84	84	112	79	81	88
11 times current	149	92	147	133	125	129
16 times current	154	132	183	197	127	159

[1]Approximately highest level in range of alternatives.

Source: Scire and Tino (1996).

Table 4-9. May Prescribed Burn Scenarios, Project Area.

Amount of Prescribed Fire	Number of Grid Cells with Perceptibly Decreased Visibility 5/4	5/5	5/6	5/7	5/8	5/9	5/10	5/11	Average
Current level	11	13	9	12	16	14	13	0	11
2 times current	20	52	22	39	40	23	0	0	25
3 times current[1]	44	61	33	35	50	15	0	0	30
4 times current	56	52	38	68	58	15	9	0	37
6 times current	71	114	72	87	129	26	0	0	62
8.5 times current	108	112	80	100	107	64	7	0	72
11 times current	119	138	106	145	218	88	10	0	103
16 times current	142	249	158	128	210	131	136	0	144

[1]Approximately highest level in range of alternatives.

Source: Scire and Tino (1996).

Table 4-10. Fall Prescribed Burn Scenarios, Project Area.

Amount of Prescribed Fire	Number of Grid Cells with Perceptibly Decreased Visibility 10/14	10/15	10/16	10/17	10/18	10/19	Average
Current level	109	40	76	80	64	147	65
2 times current	162	111	158	149	121	231	117
3 times current[1]	295	166	248	224	241	355	191
4 times current	399	320	332	334	312	476	272
6 times current	510	477	612	502	423	623	393
8.5 times current	707	700	886	751	609	844	562
11 times current	782	805	1176	941	729	1038	684
16 times current	792	836	1307	1239	680	1099	744

[1]Approximately highest level in range of alternatives.

Source: Scire and Tino (1996).

Table 4-11. Summer Wildfire Scenarios, Project Area.

Wildfire Episode	Acreage Levels	Number of Grid Cells with Perceptibly Reduced Visibility Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Average
8/8-8/13/90	25% of Acres	9	103	107	281	432	685	910	1061	449
	50% of Acres	19	215	242	470	737	1080	1314	1597	709
	Actual Acres	26	322	402	757	1077	1541	1900	2238	1033
7/27-8/3/94	25% of Acres	88	551	636	792	768	1043	1194	1443	814
	50% of Acres	104	735	1040	1434	1363	1543	1820	2089	1266
	Actual Acres	130	914	1327	1859	1807	2092	2305	2570	1625
8/20-8/27/94	25% of Acres	82	471	767	878	808	979	1186	1468	830
	50% of Acres	109	599	976	1177	1075	1294	1723	2155	1139
	Actual Acres	159	720	1121	1408	1350	1735	2383	2437	1414

Source: Scire and Tino (1996).

The results from the CRBSUM modeling of smoke displayed differences among alternatives for total smoke production when wildfire and prescribed fire were combined. Alternatives 4 and 6 would provide the highest levels of smoke reduction through emphasizing planned ignitions of short duration prescribed fires that have high smoke dispersion, using intergovernmental coordination. Alternatives 3 and 5 would provide moderate levels of smoke reduction and Alternatives 7, 1, and 2 would provide the lowest levels of smoke reduction.

Management of BLM- and Forest Service-administered lands can not strongly influence the source of pollutants or climate change. However, the potential effects of air pollutants and climate change on biotic communities can be mitigated through managing to minimize stress on vegetation and through monitoring. Alternatives that would result in rapid transition to healthy, functioning landscapes would provide the best option for reducing potential negative effects. In addition, alternatives that would result in a diversity of species adapted to their appropriate site conditions would have higher potential to sustain productivity. Alternatives that emphasize the recovery of key dominant species that have declined, such as western white pine, whitebark pine, ponderosa pine, aspen, bluebunch wheatgrass, and native shrub species, would have higher potential for resiliency to air pollution and climate change.

Some species, such as ponderosa pine, are much more vulnerable to air pollution than other species. Alternatives that would promote technology to select genetic varieties of plant species that are resistant to effects from pollution would have higher potential to promote resiliency. Alternatives that would encourage monitoring of deposition and effects of air pollutants, and would help to predict pollution source/receptor relationships and risk of effects would more likely sustain ecosystem diversity and productivity.

The effects of alternatives on landscape health provide an indicator for reducing stress on biotic communities. Alternatives 3, 4, 6, and 7, would have the greatest ability to improve landscape health; Alternatives 1, 2, and 5 would provide almost no improvement in landscape health that would reduce stress. For further information see Effects on Landscape Health later in this chapter. Monitoring and prediction of potential effects (with feedback to the EPA) would be best addressed by Alternatives 6, 4, and 3 respectively, with 7 and 5 at moderate levels, and 2 and 1 at the lowest levels.

Conclusions

Fires emit large amounts of particulate matter and other pollutants relative to other sources of air pollution. Most of the alternatives presented in this EIS would increase the amount of prescribed burning conducted for forest and rangeland management. This analysis has

attempted to evaluate the air quality impacts of programmatic increases in prescribed burning.

In general, this analysis reveals that wildfire impacts on air quality may be significantly greater in magnitude than emissions from prescribed burning. In part, this may be attributable to the fact that several States within the project area have smoke management plans that only permit prescribed fires during meteorological periods that are favorable to the dispersion of smoke. However, this analysis provides only a gross relative assessment of the impacts from wildfire and prescribed fire on air quality. Frequency of the impacts was not considered. Scientific limitations prohibit concluding that wildfires will always pose a greater air quality hazard than prescribed fires.

The air quality modeling also suggests that prescribed burning particulate emissions considered alone may not cause widespread, regional-scale exceedances of the National Ambient Air Quality Standards. However, evaluation of ambient air and compliance with the NAAQS is based on the cumulative impacts from all sources of air pollution on ambient air. This analysis did not assess the impacts from other sources of particulate matter pollution. The modeling analyses also did not adequately assess the possibility for localized exceedances of the NAAQS caused by prescribed burning emissions. The modeling results do suggest that regional-scale degradation of visibility is possible due to prescribed burning emissions.

In order to evaluate programmatic changes in land management alternatives, this analysis was conducted on a very broad scale. While this scale of analysis allows a general comparison of alternatives, the broad scale of this analysis may mask subregional and smaller-scale impacts. More detailed air quality analyses should be conducted at subsequent planning levels when emissions can be more accurately quantified and the locations and meteorology associated with a specific planned burn are known.

Effects of other pollutants are best addressed through monitoring and management for landscape health and monitoring.

Effects of the Alternatives on Terrestrial Aspects of the Ecosystem

This section presents the effects of alternatives on forestlands, rangelands, and terrestrial plant and animal species. Each subject area is discussed in the following order: summary of key effects, assumptions, limitations, causes for the effects, methods for determining effects, and the analysis of effects of the alternatives.

Forestlands

Assumptions

The following major assumptions made by the Science Integration Team during their

Summary of Key Effects and Conclusions:

- Overall, Alternatives 4 and 6 would be most effective in changing forest conditions to a more desirable pattern of forest structural stages and composition. They would reverse these current undesirable trends: high amounts of mid-seral in the dry and moist forests, high amounts of late-seral multi-layer in the dry and moist forests, less late-seral single-layer in the dry forests, fewer large trees and shade intolerant species. Alternatives 3 and 5 would have slower transitions than Alternatives 4 and 6. They would be less effective in restoring desirable structure and composition on the landscape. Alternatives 1, 2, and 7 would be the least effective overall in reversing current declining trends in forest health.

Effects on Trends on Forestlands

- All alternatives would reduce the amount of mid-seral in the moist forests and move it within historical range of variability in the long term. Alternatives 3, 4, and 6 would have the greatest reductions.
- All alternatives would reduce the amount of late-seral multi-layered moist forest and move within historical range of variability in 100 years. Alternatives 1 and 5 would show greatest reductions but differences among alternatives would be small.
- All alternatives would increase the late-seral multi-layered cold forest to within historical range of variability in the short and long terms. Alternatives 1, 2, 6, and 7 would show the greatest increases but differences among alternatives would be small.
- All alternatives would increase the late-seral single-layer dry forest in the long term. Alternatives 3 and 4 would have the greatest increases due to restoration of late-seral multi-layered forest, followed by Alternatives 5 and 6.
- Alternatives 1 and 2 would lead to reductions in interior ponderosa pine, western larch, and western white pine.
- Alternatives 3 through 7 (outside reserves), would lead to increases in interior ponderosa pine, western larch, western white pine, and large tree components in the short and long term.

Effects on Trends Toward the Desired Range of Future Condition in Forested Potential Vegetation Groups

- In the long term, forested potential vegetation groups would move toward their desired range of future condition more effectively under Alternatives 3, 4, 5, and 6, than under Alternatives 1, 2, and 7.

Effects on Successional and Disturbance Processes Across the Project Area

- In Alternatives 1, 2, and 5 (in timber priority areas), young forest structures would tend to be relatively more uniform in spacing and size, with smaller patch sizes and lower representation of large tree components than for Alternatives 3, 4, 6, and 7.
- Alternatives 4 and 6 would result in young, mid-seral, and late-seral forest structures, composition, and disturbance patterns that are more similar to historical conditions than the other alternatives. These alternative would be the most successful in restoring western larch, western white pine, interior ponderosa pine, whitebark pine, alpine larch, and large tree components.
- Alternatives 3 and 7 (outside reserves) would result in a mixture of uniform and non-uniform tree size and spacing in the young forest stage. Alternative 7 (inside reserves) would result in uncharacteristically large patch sizes of young forest in the short term.
- Alternatives 1 and 2 would have more forests move from late-seral to mid-seral, and from mid-seral and late-seral single-layer to late-seral multi-layer forest structure than the other alternatives. These alternatives would result in forest structures and compositions that are most dissimilar to historical conditions.
- Alternatives 3 through 7 (outside reserves) would have higher transitions of mid- seral and late-seral multi-layer to late-seral single-layer in the dry forests than the other alternatives.

Effects on Insects and Disease

- Alternatives 1, 2, and 7 would produce forest structure and composition with the highest susceptibility to insects and disease.

Effects on Fire Regimes

- Under Alternatives 1, 2, and 7 the amount of wildfire in dry and moist forests would be less than historical levels but the amount of crown fire in dry forests would approximate historical levels. Alternatives 3, 4, 5, and 6 would have lower levels of wildfire than the other alternatives in all forested potential vegetation groups.

evaluation of alternatives apply to both forestlands and rangelands. Additional assumptions that apply only to rangelands can be found in the Rangelands section.

- Priorities for management actions within forest and range clusters and potential vegetation groups follow the themes of the alternatives and the associated Columbia River Basin Successional Model (CRBSUM) prescription mapping. Priorities do not follow the specific simulated response from CRBSUM, which provides differences in trends rather than specific amounts.

- Because of its broad scale, the Science Integration Team (SIT) did not fully characterize riparian conditions and trends in the *Scientific Assessment* (Quigley, Lee, and Arbelbide 1996); however, to understand riparian conditions and trends, they SIT sampled subwatersheds and described trends related to disturbance and management activities.

- The modeled amount and intensity of fires may have underestimated actual conditions in areas of high fuel loading and where landscape patterns are significantly different than they were historically. Modeling was not able to account for blow up fire behavior on large blocks of land with contiguous fuels during extreme summer weather conditions. The SIT recognized and compensated for this in a qualitative manner in the *Evaluation of Alternatives*.

- In general, Alternatives 1 and 2:

  - Emphasize traditional management treatments (existing plans).

  - Rely heavily on even-aged timber management strategies emphasizing commodity production with mitigation for other resource values.

  - Alternative 1 does not have an overall cold water fish and riparian management strategy. Alternative 2 includes PACFISH and INFISH standards.

  - Reflect an understanding that some forest and rangeland conditions needed improvement. Since then, however, agencies have increased their understanding of the role of nature- and human-induced disturbance regimes and how these can contribute to more sustainable patterns and structures across the landscapes.

- In general. Alternatives 3 through 7:

  - Rely less on even-aged timber management and focus strongly on reversing the decline in large trees and late-seral forest structure.

  - Have a consistent approach and call for management of aquatic and riparian resources to occur in a landscape context. A primary objective would be to maintain or improve aquatic/riparian functions and processes rather than to mitigate commodity production.

  - Have varying levels of increased emphasis on hierarchically connected landscape analysis for assessment of properly functioning landscape patterns and associated landscape health. This results in differences in levels of restoration of landscape patterns, habitat connectivity, and ecosystem function, process, and structure.

  - Use treatments and strategies that are based on landscape health rather than driven by the production of commodities.

  - In the long term, the alternative themes and desired range of future conditions will predominate and the potential conflict of broad-scale themes and desired conditions with fine-scale standards will be resolved.

  - During each sub-basin review, there would be a rating of risk and opportunities throughout the sub-basins, which would lead to an improved fit of standards to the landscape.

Table 4-12 summarizes major differences in assumptions made among alternatives by the Landscape Ecology staff of the SIT. The table rates each alternative against the following basic assumption criteria:

- *Landscape Approach* ~ Management of BLM- or Forest Service-administered lands

moves towards a landscape approach to provide for connected habitats and flows of resources. Watersheds dominated by BLM- or Forest Service-administered lands have the highest chance of achieving long-term desired patterns.

- *Successful Ability to Resemble Conditions/ Represent Processes* ~ Management develops the ability to assess and implement landscape management to more closely resemble desired landscape and community conditions and processes both temporally (through time) and spatially (on the ground). Emphasis is on understanding the limitations and options of the current biological and physical conditions and managing within that template.

- *Hierarchical Assessment, Implementation, Monitoring, and Evaluation* ~ Inventory programs and methods would be redesigned to provide an integrated understanding of ecological conditions and resource values at many different scales.

- *Prioritization and Integration of Activities* ~ Implementation of activities to produce commodities and restore landscape conditions is regionally prioritized during subbasin review 0to integrate landscape, aquatic, and terrestrial species, social, and economic needs.

- *Concentration of Activities Temporally and Spatially* ~ Implementation of activities tends to be concentrated temporally and spatially.

- *Road Management* ~ New road construction would generally occur in low sensitivity land types, within the context of objectives specifying no net increase in road densities in any cluster. In moderate to high sensitivity watersheds and land types, the road management priorities are road improvements or road density reductions.

- *Integrated Fire Management* ~ Fire suppression and fuels management are managed together. Fuels in wilderness and semi-primitive areas are actively managed to decrease fuel loading. Wildfires over 100 acres that escape initial attack are managed in the context of broad-scale landscapes to limit risk to lives, property, and resource investments.

- *Forest and Rangeland Integrated Landscape Management* ~ The design and implementation of management activities are integrated. Management emphasis is on ecosystem processes which are in sync with biological and physical conditions of the landscape.

- *Woodland Potential Vegetation Group* ~ Ecological integrity improves through time by addressing conditions relative to the effects of fire exclusion, excessive livestock grazing, and the invasion of exotic forbs and annual grasses. (See Rangelands Assumptions.)

- *Dry and Moist Forest Potential Vegetation Groups* ~ Ecological integrity improves through time by addressing conditions relative to the effects of tree harvest, roads, fire exclusion, and insects and disease.

- *Cold Forest Potential Vegetation Group* ~ Ecological integrity improves through time by addressing conditions relative to the effects of harvest, roads, fire exclusion, and insects and disease.

- *Dry Grass, Dry Shrub, and Cool Shrub Potential Vegetation Groups* ~ Ecological integrity improves through time by addressing conditions relative to the effects of fire exclusion, excessive grazing, and invasion of exotic forbs and annual grasses. (See Rangelands Assumptions.)

- *Riparian Potential Vegetation Group* ~ Ecological integrity improves through time by addressing conditions relative to the effects of excessive grazing, invasion of exotics, fire exclusion, and flooding disturbances.

Limitations

The following limitations were considered in the analysis of effects of alternatives:

- Projected effects of the alternatives on extent of terrestrial communities and/or structural stages within potential vegetation groups are *broad-scale* effects (1km^2 resolution). Hence, these effects do not take into consideration smaller scale (mid-scale or fine-scale) landscape patterns. However, projected effects of the alternatives on fire regimes and insect and disease

Table 4-12. Rating of Alternatives to Meet Landscape Integrity Assumption Criteria.

Landscape Management	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
Landscape Approach	L-Does not provide a landscape approach	L-Does not provide a landscape approach	M-Emphasis on local fix of existing Plans. Less emphasis on the ERU and ICRB context.	H-High emphasis on context and coordination at ERU and ICRB levels.	M-Emphasis on subregional economic efficiency.	H-High emphasis on context and coordination at ERU and ICRB levels.	M-Within reserves - no landscape approach. Outside reserves-similar to Alternative 3.
Successful Ability to Mimic Conditions/ Represent Processes	L-No emphasis to mimic conditions of BPT or represent associated processes.	L-No emphasis to mimic conditions of BPT or represent associated processes.	L-Local fix would not provide for the necessary technology development or transfer and coordination to achieve the assumption.	M-Active mimicking of BPT conditions and associated processes.	L-Emphasis on economic efficiency provides impetus on only subset of landscapes.	H-Adaptive mimicking of BPT conditions and associated processes.	L-Reserves may emphasize wildfires and prescribed fires as primary disturbances while outside reserves would be similar to Alt 3.
Hierarchical Assessment, Implementation, Monitoring, and Evaluation	L-Little emphasis for the necessary larger scale inventory, monitoring, and modelling.	L-Little emphasis for the necessary larger scale inventory, monitoring, and modelling.	L-Little emphasis for the necessary larger scale inventory, monitoring, and modelling.	M-Less complete understanding of BPT conditions and associated processes than Alt 6 but more than Alts. 3,5,7 because of a more rapid implementation.	L-Emphasis on economic efficiency provides for larger scale implementation, monitoring, and evaluation on only a subset of landscapes.	H-Higher emphasis for the necessary larger scale inventory, monitoring, and modelling.	M-Less complete understanding of BPT conditions and associated processes than Alts. 1-6 because of potential differences in emphasis for areas within and outside of reserves.
Prioritization and Integration of Activities	L-Emphasis is at the existing plan level.	L-Emphasis is at the existing plan level.	L-Emphasis is at the existing plan level.	H-Emphasis is on landscape elements at all scales.	L-Emphasis on economic efficiency would conflict with priorities for integrity.	H-Emphasis is on landscape elements at all scales.	L-Constraints on prioritization and integration of activities within reserves and same as Alt 3 outside of reserves.
Concentration of Activities Temporally and Spatially	L-Fragmentation of activities both temporally and spatially.	L-Fragmentation of activities both temporally and spatially.	M-Can occur locally at a watershed scale but lower emphasis at larger scales.	H-Emphasis of concentrating activities at several scales.	M-Potential to have higher emphasis on economically efficient elements and areas.	H-Emphasis of concentrating activities at several scales.	M-Within reserves would allow concentration of wildfire and prescribed fire but outside of reserves would tend to have fragmented activities.

Table 4-12. Rating of Alternatives to Meet Landscape Integrity Assumption Criteria. (cont.)

Landscape Management	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
Road Management	L-Less emphasis than Alt 3.	L-Less emphasis than Alt 3.	M-Emphasis on correcting local problems but lacks emphasis on connections to larger scales.	H-Emphasis on active corrections of problems at a multi-scale level.	L-Priority problem areas may not be improved at a rate consistent with larger-scale relationships if not economically efficient.	H-Emphasis on active corrections of problems at a multi-scale level; would prioritize to fix conditions which are most in conflict with the BPT first.	M-Areas within reserves will not be developed and outside of reserves would be the same as Alt 3.
Fire Management	L-Less emphasis on integrating fire and fuels management.	L-Less emphasis on integrating fire and fuels management.	M-Achieve improvement by fixing many of the local fire and fuel problems.	H-Emphasize an integrated approach.	M-An integrated approach would be supported in the long term.	H-Emphasize an integrated approach.	L-Less emphasis for active management within reserves and same as Alt 3 outside of reserves.
Forest and Rangeland Integrated Landscape Management	L-Less emphasis to apply an integrated landscape management approach.	L-Less emphasis to apply an integrated landscape management approach.	M-High potential to integrate to achieve local fixes but low potential for achieving broad- and mid- scale fixes which are not a local priority.	M-Activities are consistent with improving landscape conditions in an integrated fashion but at a slower rate than Alt 6.	L-Low emphasis on local conditions and elements not related to economic efficiency but moderate potential to achieve integrated objectives and activities.	H-Activities are consistent with improving landscape conditions in an integrated fashion.	L-High potential to have separate rather than integrated approaches to managing within and outside of reserves. Emphasis for both areas would likely be non-integrated.
Woodland PVG	L-No improvement is expected because of lack of a landscape approach.	L-No improvement is expected because of lack of a landscape approach.	M-May be addressed in some local plans.	H-Active emphasis.	L-Low emphasis.	M-Less active emphasis than Alt 4 but more than Alts 1-3, 7.	L-May not receive emphasis within or outside of reserves.
Dry and Moist Forest PVGs	L-Lack of landscape context.	L-Lack of landscape context.	M-Some emphasis because of local fix of existing plans.	H-Active emphasis at multi-scale landscape level.	M-Potential mixed emphasis for economic efficiency.	M-Less active emphasis at a multi-scale landscape level.	L-Potential lack of active management within reserves.
Cold Forest PVG	L-Lack of emphasis for this PVG, lack of landscape context, and lack of emphasis on whitebark pine recovery.	L-Lack of emphasis for this PVG, lack of landscape context, and lack of emphasis on whitebark pine recovery.	L-Emphasis on local fix of existing plans which would not provide context or emphasis for this PVG.	H-Emphasis on active management and larger-scale context.	L-Less emphasis due to relatively low economic potentials.	M-Emphasis on active management and larger-scale context but at a slower rate than Alts 1-5, 7.	L-Potential lack of active management emphasis in reserves and lack of emphasis outside of reserves.

Dry Grass, Dry Shrub, Cool Shrub PVGs	L-Lack of landscape emphasis for rangelands.	L-Lack of landscape emphasis for rangelands.	M-Potential local emphasis for watershe- level improvements.	H-Emphasis on active management and larger-scale context	M-Potential high emphasis on economic efficiency where they make up major part of livestock forage base but low emphasis in other areas.	M-Emphasis on active management and larger-scale context but at a slower rate than Alts 1-5, 7.	L-Potential lack of active management emphasis in reserves and lack of emphasis outside of reserves.
Riparian PVG	M-Moderate emphasis on recovery.	M-Moderate emphasis on recovery.	M-Moderate emphasis on local fixes of existing plans but lacks larger-scale context.	H-Emphasis on active management and larger-scale context.	M-Emphasis on recovery in economically efficient areas but lack of emphasis in other areas.	M-Emphasis on active management and larger-scale context but at a slower rate.	M-Riparian systems within reserves will remain stable or improve with time and riparian systems will be same as Alt 3.

Abbreviations used in the table:
- L = low
- M = moderate
- H = high
- ERU = ecological reporting unit
- BPT = biophysical template
- PVG = potential vegetation group

Source: Adapted from Quigley, Lee, and Arbelbide (1997).

susceptibility were rectified for mid-scale patterns through the use of indices which take into account mid-scale landscape disturbance regimes, mid-scale patterns (inclusions of areas of low insect and disease susceptibility within larger areas of high susceptibility), and fine-scale live and dead vegetation and fuels composition and structure. With final evaluation, similar adjustments may be made to projections of the extent of terrestrial communities and structural stages by potential vegetation group.

- For Alternative 3 the CRBSUM simulation used higher levels of management activities (timber harvest, thinning, prescribed fire, watershed restoration) than intended or prescribed in Chapter 3. This difference was accounted for in the evaluation of effects on fire regimes and insect and disease susceptibility, but not in the evaluation of trends in terrestrial communities or structural stages by potential vegetation group. Consequently, effects for Alternative 3 presented here may slightly overestimate or underestimate actual extent of terrestrial communities or structural stages due to inflated activity levels. Unless otherwise noted, it was assumed that the relative effects of Alternative 3 compared to other alternatives were not substantially affected by this discrepancy.

- Evaluation and reporting of effects on forest and range ecosystems were done largely independently. However, approximately 60 percent of the project area is a mosaic of forest and range ecosystems. These forest/rangeland mosaics typically have the highest diversity in disturbance regime energy, resulting in a high diversity of vegetation and landscape patterns. Further evaluation may be made to determine the abilities of the alternatives to achieve integrated forestland-rangeland-fire-hydrologic-biotic outcomes at a landscape scale.

- Comparisons between effects on forested potential vegetation groups and desired range of future condition were not made by the Science Integration Team. These comparisons were derived by the EIS Team from data provided by the Landscape Ecology staff of the SIT for the projected extent and distribution of forested potential vegetation groups and from the desired range of future condition developed for seral stages by potential vegetation group for Chapter 3.

- All effects of alternatives on forestlands are for Forest Service- and BLM- administered lands only, unless otherwise noted.

Causes of the Effects of Each Alternative on Forestlands

All alternatives use tree harvest, thinning, prescribed fire, and passive management to some degree to create desired changes on forestlands. The degree and rate at which these activities are applied differ among alternatives, as are the methods used, and/or objectives addressed.

Trends

Historical trends on forestlands that contribute to the effects of alternatives include:

- Over 50 years of fire exclusion has resulted in increased amounts of mid- and late-seral multi-layer communities relative to their historical levels. The result is that many landscapes have disturbance regimes and other processes which are inconsistent with their biological conditions.

- Over 50 years of even-aged timber harvest practices have created large areas of forest and landscape structures that are inconsistent with the biological and physical environment and endemic disturbance regimes.

- Significant declines in viability of western white pine and whitebark pine have occurred due to white pine blister rust.

- Biomass (fuel) has accumulated in the forest.

- Reforestation has established plant communities that are susceptible to stand-replacing wildfire.

- Flammable exotic weeds have become established and are spreading, particularly in rangelands.

Management Actions

The primary management actions causing changes in distribution, composition, structure, and processes of forest vegetation are listed below for each alternative. "Traditional harvest" refers to the predominant use of even-aged timber management practices. "Ecological harvest" is the use of vegetation management practices, usually uneven-aged, to restore or maintain stand structure, stand density, and species composition to levels which are in sync with biological and physical conditions, and the natural processes and cycles of the landscape.

- *Alternative 1*: Traditional harvest, artificial regeneration, fire suppression, traditional fire management emphasizing fuel reduction, with an emphasis on local input into management decisions.

- *Alternative 2*: Traditional harvest, fire suppression, artificial regeneration (genetic improvement of planting stock), traditional fire management emphasizing fuel reduction, protection of riparian areas (PACFISH, INFISH) with local emphasis.

- *Alternative 3*: Ecological harvest, thinning, prescribed fire, artificial regeneration (genetic improvement of planting stock), natural regeneration, with an emphasis on local input into management decisions.

- *Alternative 4*: Ecological harvest and prescribed fire (resembling ecological processes), artificial regeneration (genetic improvement of planting stock), natural regeneration, landscape approach to management, multi-scale/integrated approach to analysis and implementation, concentration of activities spatially and temporally.

- *Alternative 5*: Ecological and traditional harvest, thinning, prescribed fire, artificial regeneration (genetic improvement of planting stock), with emphasis on timber production areas.

- *Alternative 6*: Ecological harvest and prescribed fire, artificial regeneration (genetic improvement of planting stock), natural regeneration, emphasis on adaptive management, landscape approach to management, multi-scale/integrated approach to analysis and implementation, concentration of activities spatially and temporally.

- *Alternative 7*: Ecological harvest, thinning, prescribed fire (outside reserves), passive management (for example, wildfire within reserves), artificial regeneration (genetic improvement of planting stock).

The trend in the amount and type of wildfire varies among alternatives primarily because of differences in the amount of prescribed fire, harvest, and thinning that change forest structure. Some amount of fire exclusion would still occur within all alternatives, through wildfire suppression and livestock grazing of fine fuels.

Methodology: How Effects on Forest Systems were Estimated

Simulation Strategies

To simulate vegetation composition, structure, and associated disturbance by alternative, the SIT used the spatial and temporal Columbia River Basin Successional Model (CRBSUM) (Keane et al. 1996). The model predicts disturbance dynamics and vegetation response through time at a landscape level. Differences in alternatives are simulated by using combinations of types and rates of management activities that were similar to those described for each alternative. Management activities, such as timber harvest, prescribed fire, and fire suppression, interact with other disturbances, such as wildfire, insect and disease mortality, and drought, to predict vegetation types and patterns over time across the landscape.

The types and rates of management and other disturbances differ among management prescription models. Each prescription model represents a type of management for the various vegetation types across the Interior Columbia Basin, as applied to the two different EIS areas and various management classes. Management classes represent areas of different ownerships and management

emphasis, within an EIS area. Within the BLM/Forest Service administered lands, the management classes include roadless natural process dominated areas (Wilderness and back country); roadless, human/natural process dominated areas (typically visually sensitive or semi-primitive areas); roadless, human process dominated areas (typically non-roaded areas managed for commodities or developed recreation); roaded, human/natural process dominated areas (recreation areas); and roaded, human process dominated areas (timber harvest areas).

Fire and Forest Insect and Disease Disturbance Regimes

To improve predictions of net effects on fire and insect and disease disturbance regimes, the Landscape Ecology section of the *Evaluation of Alternatives* used an index that integrates broad-scale, mid-scale, and fine-scale attributes. Broad-scale landscape disturbance regime variables were based on knowledge of mid-scale landscape disturbance regime variables, mid-scale patterns, and fine-scale live and dead vegetation and fuels composition and structure. The resulting variable is still a broad-scale index, but it incorporates knowledge of vegetation patterns and community composition consistent with the biological, physical, and disturbance characteristics for each management class and type of management.

Effects of the Alternatives on Forestlands

Introduction

The *Landscape Dynamics* chapter of the *Assessment of Ecosystem Components* (Quigley and Arbelbide 1996) for forestlands was organized by terrestrial communities to be consistent with vegetation class stratifications used in the *Terrestrial Ecology* (Marcot et al. 1996) chapter. Table 4-13 provides a crosswalk between terrestrial communities and potential vegetation groups (PVGs) to facilitate review of effects consistent with discussions in the Affected Environment chapter of this EIS (Chapter 2). Lower montane, montane, and subalpine terrestrial communities can overlap on the ground, and do not directly relate to the dry forest, moist forest, or cold forest potential vegetation groups. For example, both dry forest and moist forest groups are represented within the montane terrestrial community. Terrestrial communities relate to *existing* forest composition and structure, rather than to *potential* vegetation.

Effects of alternatives on forested potential vegetation groups and terrestrial communities are described by comparison to the modeled historical range of variability (HRV), desired range of future condition (DRFC), and/or current conditions. The Landscape Ecology section of the *Evaluation of Alternatives* based its use of historical range of variability on Morgan et al. (1994). The historical range of variability is a useful benchmark for understanding how the physical and biological conditions, and succession and disturbance regimes can be balanced to produce an ecosystem that quickly recovers from stress and disturbance. It provides insight into native biodiversity relationships, and effects on succession/disturbance regimes. The historical range of variability provides a reference for assessing the current conditions and future differences among management scenarios or alternatives. Comparisons to the historical range of variability are not intended to imply that historical conditions do or should equate to management goals or the desired range of future condition, but rather to determine how effectively alternatives would meet management goals.

The effects on forested systems are organized into two main sections: 1) effects on distribution, composition and structure of terrestrial communities and potential vegetation groups, and 2) effects on successional and disturbance regimes.

Effects on Forest Distribution, Composition, and Structure

Effects of the alternatives on terrestrial community distribution, composition, and structure are described for the planning area or for the project area as a whole in terms of: 1) geographical extent and trends from historical and current conditions, 2) subbasin departures from historical ranges of variability, and 3) relative landscape patterns.

Table 4-13. Crosswalk Between Forestland Potential Vegetation Groups and Terrestrial Communities.

Terrestrial Community (TC)	Potential Vegetation Group (PVG)
Lower Montane and Montane Forest	
early seral	Dry Forest
mid-seral	
late seral multi-layer	
late seral single-layer	
Lower Montane, Montane and Subalpine Forest	
early seral	Moist Forest
mid-seral	
late seral multi-layer	
late seral single-layer	
Montane and Subalpine Forest	
early seral	Cold Forest
mid-seral	
late seral multi-layer	
late seral single-layer	

Source: ICBEMP GIS data.

Effects of the alternatives on distribution, composition, and structure of terrestrial communities are described for each forested potential vegetation group in the UCRB planning area in relation to trends toward or away from the desired range of future conditions.

Geographical Extent of Forested Communities

Table 4-14 displays the historical and current percent of the UCRB area in each terrestrial community. It then shows the relative amount of change and direction from current conditions in the short (10 years) and long term (100 years). The effects of alternatives on the geographical extent of forested communities follow. Causes for observed changes in the extent and trends of forested communities between current conditions and those projected for the alternatives can be found in the Effects on Forested Community Successional and Disturbance Regimes section. More detailed discussion can be found in the Landscape Ecology section of the *Evaluation of Alternatives*.

The Landscape section of the *Evaluation of Alternatives* considered a 20 percent or greater change in geographical extent of a terrestrial community to be an ecologically significant trend. The following communities were projected to increase in area by 20 percent or more relative to current conditions:

- lower montane early-seral forest in 10- and 100-year projections, all alternatives.
- lower montane mid-seral forest in 100-year projections, Alternatives 1 and 2.
- lower montane late-seral multi-layer forest in 100-year projections, all alternatives.
- lower montane late-seral single-layer forest in 10-year projections, Alternatives 4 and 5.
- lower montane late-seral single-layer forest in 100-year projection, all alternatives.
- montane late-seral multi-layer forest in 10- and 100-year projections, all alternatives.
- subalpine late-seral multi-layer forest in 10- and 100-year projections, all alternatives.

Table 4-14. Change in Terrestrial Forest Communities, UCRB Planning Area.

Terrestrial Community[1]	Historic[2]	Current[3]	Alt 1		Alt 2		Alt 3		Alt 4		Alt 5		Alt 6		Alt 7	
			10yr	100yr	10yr	100yr	10yr	100yr	10yr	100yr	10yr	100yr	10yr	100yr	10yr	100yr
Lower Montane																
early seral	1-2	0	++	++	++	++	++	++	++	++	++	++	++	++	++	++
mid seral	3-4	5	NC	++	NC	++	-	-	-	-	-	NC	-	NC	-	NC
late seral multi-layer	1-2	1	NC	++	NC	++	NC	++	NC	++	NC	++	NC	++	+	++
late seral single-layer	2-4	0	NC	++	NC	++	+	++	++	++	++	++	+	++	NC	++
Montane																
early seral	9-13	11	+	-	NC	-	+	NC	+	NC	+	NC	+	-	NC	-
mid-seral	16-21	26	-	- -	-	- -	-	- -	-	- -	-	- -	NC	- -	-	- -
late seral multi-layer	5-10	3	++	++	++	++	++	++	++	++	++	++	++	++	++	++
late seral single-layer	1-2	1	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Subalpine																
early seral	2-4	4	- -	- -	- -	- -	NC	NC	NC	NC	- -	- -	- -	- -	- -	- -
mid-seral	5-6	6	NC	-	NC	-	NC	- -	NC	- -	NC	- -	NC	-	NC	-
late seral multi-story	2-5	1	++	++	++	++	++	++	++	++	++	++	++	++	++	++
late seral single-story	1-2	2	NC	- -	NC	- -	NC	- -	NC	- -	NC	- -	NC	- -	NC	- -

This table displays historical and current percentages of the UCRB planning area in each terrestrial community. Under the seven alternatives are 10- and 100-year projections or relative degree and direction of change from current conditions for each community type.

(++) = greater than or equal to a 20% increase
(+) = up to a 20% increase
(-) = up to a 20% decrease
(--) = greater than or equal to a 20% decrease
(NC) = no change from current

[1] See table 4-13.
[2] Predicted historic range modelled over 400 years.
[3] Current conditions (0 = 0 to .4%).

Source: ICBEMP GIS data (1 km² raster data).

The following communities were projected to decrease in area by 20 percent or more relative to current conditions:

- montane mid-seral forest in 100-year projections, all alternatives.
- subalpine early-seral forest in 10- and 100-year projections, Alternatives 1, 2, 5, 6, and 7.
- subalpine mid-seral forest in 100-year projections, Alternatives 3, 4, and 5.
- subalpine late-seral single-layer forest in 100-year projections, all alternatives.

Aspen cover types are associated with riparian, cold forest, dry forest, and moist forest potential vegetation groups (lower montane, montane, and subalpine terrestrial communities) within the project area. The amount of aspen has decreased from historical times and will most likely continue to decrease for Alternatives 1 and 2. Projections indicate that active restoration of aspen is required in Alternatives 3 through 7 (outside reserves) to reverse a declining trend.

Trends in Forested Communities

In the UCRB, amounts of lower montane early-seral, lower montane mid-seral, lower montane late-seral single-layer, montane mid-seral, montane late-seral multi-layer, and subalpine late-seral multi-layer forest are currently outside historical range of variability. While the historical range is not a management goal, it is useful as a benchmark for understanding relationships between biological and physical conditions, succession/disturbance regimes, and the effects of alternatives on these relationships. Causes for observed changes in trends of forested communities between current and projected conditions for the alternatives can be found in the Effects on Forested Community Successional and Disturbance Regimes section below.

All alternatives are projected to reverse current trends in lower montane early-seral, montane mid-seral, montane late-seral multi-layer, and subalpine late-seral multi-layer forests, and to move these communities toward or within the historical range of variability within 10 and/or 100 years.

Alternatives 3 through 6 are projected to reverse current trends, and move lower montane mid-seral toward or within historical range of variability within 10 years, but by 100 years, trends for this community in Alternatives 5 and 6 have moved back to greater amounts than would have been expected under historical conditions. This is likely due to a slower rate of activity in Alternative 6 and the lower relative harvest and thinning emphasis in Alternative 5 in lower montane (dry forest) communities relative to other alternatives.

All alternatives are projected to reverse decreasing trends in lower montane late-seral single- layer forest. Alternatives 3 through 6 move the amount of this community to within historical range of variability within 100 years.

In the UCRB planning area, amounts of lower montane late-seral multi-layer, montane early-seral, montane late-seral single-layer, subalpine early-seral, subalpine mid-seral, and subalpine late-seral single-layer forests are within their historical range of variability. Alternatives 1, 2, and 7 are projected to increase amounts of lower montane late-seral multi-layer forest to outside historical range of variability within 100 years. Alternatives 3, 4, and 5 are projected to decrease the amounts of subalpine mid-seral forest to below historical range of variability within 100 years.

Effects on all other forested communities show no significant changes from current amounts.

Forested Potential Vegetation Groups

Table 4-15 displays current percentages of the UCRB planning area in early, mid- and late-seral stages for each potential vegetation group as well as relative amount of change and direction from current conditions in the short (10 years) and long term (100 years). Table 4-16 displays the desired range of future condition for forested seral stages by potential vegetation group for Alternatives 3 through 6. Desired ranges of future conditions for forested seral stages by potential vegetation group were not available for the no-action alternatives (1 and 2). Current plans and interim direction only generally specify desired conditions for forested seral stages; hence, effects for these alternatives have been qualitatively estimated. The following compares effects of alternatives on their relative ability to meet desired range of future condition for early, mid-, and late-seral

stages. The desired range of future condition for Alternative 5 are specified for both within and outside timber emphasis areas, and desired range of future condition for Alternative 7 are specified for both within and outside reserves (table 4-16). However, projected potential vegetation group conditions by alternative were only available for the ICBEMP area as a whole (table 4-15).

The projected abilities of the alternatives to move toward or meet the desired range of future condition for the potential vegetation groups in the short and long term are due to the themes, direction, and activity levels for each alternative and to the difference between current conditions and desired conditions. In general, for the action alternatives, desired range of future condition for forested potential vegetation groups are closest to current conditions in Alternatives 3, 5, and 7.

Dry Forest Potential Vegetation Group

In general, Alternatives 1 and 2 are rated low in their relative ability to improve the ecological integrity in the dry forest potential vegetation group because these alternatives do not require landscape level analysis to integrate management needs. There is also a lack of emphasis on improving dry forest conditions. Alternative 3 is rated as moderate to high because it is likely dry forest conditions will receive increased emphasis by Forest Service and BLM administrative units. Alternative 4 is rated as high because there is a significant emphasis on improving dry forests at a multi-scale level. Alternative 6 will also have an emphasis on dry forests at a multi-scale level, but is rated as moderate because of the slower rate of activity compared to Alternative 4. Alternative 5 is rated low to moderate because of mixed priorities across the project area. Alternative 7 is rated low to moderate because of the lack of active management of woody and fine grass fuels and fire in the reserve areas. All alternatives are projected to result in continued increases of exotic weeds in the dry forest potential vegetation group.

Alternatives 3 through 6 exceed the desired range of future condition for early-seral dry forest by 5 to 11 percent in the short term; however, Alternatives 3, 5, and 6 meet or differ only slightly from the desired range of future condition in 100 years. Alternative 4 remains outside the desired range of future condition for early-seral dry forest (6 percent greater) in 100 years, likely due to the greater emphasis on harvest in this potential vegetation group, relative to other alternatives.

Alternatives 3 through 7 exceed the desired range of future condition for amounts of mid-seral in the dry forest by 7 to 12 percent in the short term; but are within the upper end, or less than 5 percent greater than the desired range of future condition by 100 years. Alternatives 1 and 2 are likely to exceed the desired condition for amounts of mid-seral in the dry forest in the short and long term; projected amounts are 7 to 14 percent greater than the desired range of future condition for any other alternative. This is likely due to: 1) continued fire exclusion, and its effects on altering successional processes that tend to drive mid-seral forests toward late-seral structural stages, and 2) less emphasis on restoration activities, causing continued mortality of intermediate and large diameter trees from insect, disease, and stress in late-seral multi-layer forests, causing retrogression toward mid-seral structural stages. Maintenance of mid-seral stages in the dry forest above or in the upper end of the desired condition, will likely contribute to relatively high insect and disease susceptibility (see the Effects on Insects and Disease section below).

Alternative 7 is projected to exceed the desired range of future condition for late-seral multi-layer dry forest by 6 to 11 percent within 100 years due to the lack of active management within reserves. Alternative 2 is likely to be greater than the desired condition for late-seral multi-layer in the long term, since its projected amount is 7 to 17 percent greater than the desired condition for any other alternative. This is likely due to less emphasis on harvest and thinning activities in the dry forest potential vegetation group to restore late-seral single-layer from late-seral multi-layer conditions, or to reduce the amount of mid-seral forest transitioning toward late-seral multi-layer conditions. Maintenance of dry forest late-seral multi-layer structure above the desired range of future condition will likely contribute to relatively high insect and disease susceptibility (see the Effects on Insects and Disease section below).

Alternatives 4, 5, 6, and 7 outside reserves are projected to be below the desired range of

Table 4-15. Percent of Forested Potential Vegetation Groups in Each Seral Stage, UCRB Planning Area.

PVG and seral stage	Current	Alt 1 10yr	Alt 1 100yr	Alt 2 10yr	Alt 2 100yr	Alt 3 10yr	Alt 3 100yr	Alt 4 10yr	Alt 4 100yr	Alt 5 10yr	Alt 5 100yr	Alt 6 10yr	Alt 6 100yr	Alt 7 10yr	Alt 7 100yr
Dry Forest															
early seral	28	NC	- -	-	- -	+[1]	-	+[1]	-[1]	+[1]	-	+[1]	-	NC	- -
mid seral	54	NC	NC	NC	-	-[1]	- -	-[1]	- -	-[1]	- -	-[1]	- -	-[1]	-
late seral multi-story	14	+	++	++	++	-	NC	-	NC	-	+	-	++	+	++[1]
late seral single-story	2	NC	++	NC	++	++	++	++[1]	++	++[1]	++	++[1]	++	NC	++
Moist Forest															
early seral	20	+	NC	+	-	+	-	+	-	+	NC	+	-	+	-
mid-seral	74	-	- -	-	- -	-	- -	-[1]	- -	- -	- -	-	- -	-[1]	- -
late seral multi-story	5	++	++	++	++	++	++[1]	++	++[1]	++	++	++	++[1]	++	++[1]
late seral single-story	1	++	++	++	++	++	++	++	++	++	++	++	++	++	++
Cold Forest															
early seral	31	-	-	-	-	+	++	+[1]	++[1]	+	+	+	+[1]	-	-
mid-seral	46	-	+	-	NC	-	-	-	-	-	-	-	-	-	NC
late seral multi-story	8	++	++	++	++	+	++	+	++	++	++	++	++	++	++
late seral single-story	12	-	- -	-	- -	-	- -	-	- -	-	- -	-	- -	-	- -

This table displays the current percentages of each seral stage for the Forested PVG on Forest Service- and BLM-administered lands in the UCRB planning area. Under the seven alternatives are 10- and 100-year projections of relative degree and direction of change from current conditions for each community type.

(++) = greater than or equal to a 20% increase
(+) = up to a 20% increase
(-) = up to a 20% decrease
(--) = greater than or equal to a 20% decrease
(NC) = no change from current

Abbreviations used in this table: PVG = potential vegetation group

[1] Projected conditions that differ by 5% or more from desired ranges of future conditions (see table 4-16).

Source: ICBEMP GIS data (converted to 1 km^2 raster data).

Table 4-16. Desired Ranges of Future Conditions: Percent of Forested Potential Vegetation Groups in Each Seral Stage[1] Project Area.

PVG and Seral Stage	Alt 3	Alt 4	Alt 5[2]	Alt 5[3]	Alt 6	Alt 7[4]	Alt 7[5]
Dry Forest							
early-seral	15-25	10-20	10-25	15-25	10-20	20-35	15-25
mid-seral	30-45	30-40	35-45	30-45	30-40	35-45	30-45
late-seral multi-layer	10-20	10-20	15-25	10-20	10-20	5-15	10-20
late-seral single-layer	10-30	20-30	10-20	10-30	20-30	5-20	10-30
Moist Forest							
early-seral	20-30	20-35	20-30	20-30	20-35	25-40	20-30
mid-seral	45-60	40-50	45-60	45-60	40-50	45-60	45-60
late-seral multi-layer	10-20	15-25	10-25	10-20	15-25	5-15	10-20
late-seral single-layer	5-10	5-10	2-7	5-10	5-10	2-7	5-10
Cold Forest							
early-seral	25-35	20-30	25-35	25-35	20-30	30-40	25-35
mid-seral	40-50	45-55	40-50	40-50	45-55	40-50	40-50
late-seral multi-layer	10-20	10-20	10-20	10-20	10-20	5-15	10-20
late-seral single-layer	5-15	5-15	5-15	5-15	5-15	5-10	5-15

Abbreviations used in this table:
PVG = potential vegetation group
DRFC = desired range of future conditions

[1] DRFCs for seral stages by forested PVG were not available for Alternatives 1 and 2.
[2] Alternative 5 within timber Emphasis Areas.
[3] Alternative 5 outside timber Emphasis Areas.
[4] Alternative 7 within reserves.
[5] Alternative 7 outside reserves.

Source: Chapter 3, Desired Ranges of Future Conditions.

future condition for amounts of late-seral single-layer in the dry forest by 5 to 15 percent in the short term, but are similar to the desired condition in the long term. Alternatives 1 and 2 are likely to be below the desired condition for late-seral single-layer since their projected conditions are six to eight percent less than the desired conditions for any other alternative (except Alternative 7 within reserves). This is likely due to less emphasis on activities to restore late-seral single-layer from late-seral multi-layer conditions, and greater transitions from late-seral single-layer to late-seral multi-layer conditions compared to other alternatives.

Projected conditions for all other alternatives are within, or have little difference from, their desired range of future condition for early, mid-, late-seral multi-layer, or late-seral single-layer dry forest.

Moist Forest Potential Vegetation Group

In general, Alternatives 1 and 2 are rated low in their relative ability to improve the ecological integrity of the moist forest potential vegetation group due to the lack of a landscape analysis as part of these alternatives. Alternative 3 is rated as moderate because under a "local fix" of Forest and Resource Plans, it would be highly likely that this type would receive some emphasis. Alternative 4 is rated as high because there is an active emphasis on this type at a multi-scale level. Alternative 6 would also have an active emphasis on this type at a multi-scale level, but is rated as moderate to high because of the slower rate of activity compared to Alternative 4. Alternative 5 is rated low to moderate because of a potentially mixed emphasis on economic efficiency. Alternative 7 is rated low because of a lack of active management of woody and fine grass fuels and fire in the reserve areas.

Alternatives 4 and 7 are projected to exceed the desired range of future condition for mid-seral moist forest by 5 to 14 percent in the short term, but are within the desired conditions in 100 years.

Alternatives 3, 4, 6, and 7 would result in amounts of late-seral multi-layer moist forests that are similar to or greater than the desired range of future condition within 100 years (6-15 percent). Alternative 7 differs the most from the desired range of future condition (10 to 15 percent greater), followed by Alternative 3 (10 percent greater), Alternative 6 (7 percent greater), and Alternative 4 (6 percent greater). Alternative 2 may exceed the desired condition for late- seral multi-layer in the long term; its projected amounts are greater than the desired condition for any other alternative by 3 to 13 percent. This is likely due to fire exclusion and less restoration harvest and thinning activity in this potential vegetation group relative to other alternatives, causing more net transitions from mid-seral to late-seral multi-layer. Maintenance of moist forest late-seral multi-layer structure above the desired range of future condition will likely contribute to relatively high insect and disease susceptibility (see the Effects on Insects and Disease section below).

Projected conditions for all other alternatives are within or differ slightly from their desired conditions for early, mid-, late-seral multi-layer, or late-seral single-layer moist forest.

Cold Forest Potential Vegetation Group

In general, Alternatives 1 and 2 are rated low in their ability to improve ecological integrity of the cold forest because of a general lack of emphasis on active management in the cold forest, on resembling landscape composition and structure similar to historical conditions, and on whitebark pine recovery. Alternative 3 is also rated low to moderate because uncoordinated actions by local Forest Service- and BLM-administrative units are not likely to address management needs within the cold forest. Alternative 4 is rated high because of an emphasis on active management and multi-scale planning. Alternative 6 is rated moderate because of a slower rate of active management. Alternative 5 is rated low because of an emphasis on economic efficiency in a type that has relatively low economic potentials. Alternative 7 is rated low because of a potential lack of landscape emphasis outside reserves and lack of active management in reserve areas.

Alternative 4 is projected to exceed the desired range of future condition for early-seral cold forest by five and nine percent in the short and long term, respectively. Alternative 6 falls within five percent of the desired condition for early-seral cold forest in the short term, but is projected to exceed the range by five percent in the long term.

Projected conditions for all other alternatives are within or differ only slightly from their desired condition for early, mid-, late-seral multi-layer, or late-seral single-layer cold forest.

Subbasin Departures from Historical Conditions

Figures 4-3 through 4-11 display the projected percentage of subbasins above, within, and below the historical range of variability (HRV) for each forested community for the project area at 100 years. "Above HRV" refers to the percentage of subbasins containing more of that community type today than before European settlement. "Below HRV" refers to the percentage of subbasins containing less of that community type today than before European settlement. These figures provide a perspective on the likely magnitude of broad-scale terrestrial community changes in forestlands within subbasins. In determining these effects, the Landscape Ecology section of the *Evaluation of Alternatives* combined late-seral multi-layer and late-seral single-layer forest into a single-layer late-seral category for each of the lower montane, montane, and subalpine communities.

For the project area as a whole, there exist large shifts between current conditions and 100- year projections of alternatives in terms of the percentage of subbasins within the predicted historical range of conditions for each forested terrestrial community type. Causes for observed changes in the extent of forested terrestrial communities between current and projected conditions for the alternatives can be found in the Effects on Forested Community Successional and Disturbance Regimes section below. More detailed discussion can be found in the Landscape Ecology section of the *Evaluation of Alternatives*.

Few overall differences exist among alternatives, but some broad-scale, project area-wide patterns emerge:

Alternative 1: lower montane, montane mid-seral (many subbasins above the predicted historical range of conditions), and montane early-seral forests (below the predicted historical range of conditions) would deviate the most from historical conditions. Lower montane mid-seral would dramatically increase within all forested areas of the UCRB, and montane mid-seral forest would increase in the Central Idaho Mountains. Many subbasins in the Upper Clark Fork would show decreases in montane mid-seral forest, although some increases in montane early-seral forest would take place in subbasins in the Lower Clark Fork, Upper Clark Fork, and Snake Headwaters Ecological Recording Units (ERUs).

Alternatives 2, 5, and 7: lower montane mid-seral forest would deviate the most from historical conditions (many subbasins above the predicted historical range of conditions). This community would increase across much of the forested area of the UCRB.

Alternatives 3 and 4: lower montane mid-seral and subalpine early-seral forest would deviate the most from historical conditions (many subbasins above the predicted historical range of conditions). Lower montane mid-seral forest would increase across much of the forested area of the UCRB.

Alternative 6: lower montane mid-seral forest would deviate the most from historical conditions (many subbasins above the predicted historical range of conditions). Lower montane mid-seral forest would increase predominantly within the Upper Clark Fork and Central Idaho Mountains ERUs. Alternative 6 differs from other alternatives in the spatial distribution of increases in lower montane mid-seral forest due to complex interactions between relative management emphases (conserve/restore), management activity rates, succession rates, and landscape conditions (unroaded vs roaded).

Landscape Patterns

Table 4-17 displays relative effects of alternatives on landscape patterns. Relative "repatterning" emphases and trends are compared among alternatives. "Repatterning" refers to the predicted ability of alternatives to create landscape-scale terrestrial community patterns more consistent with characteristic biological and physical conditions and disturbance regimes. Although no alternative addresses repatterning directly, this effect was evaluated through the Landscape Ecology section of the *Evaluation of Alternatives* based on the desired range of future conditions, alternative themes, and relative types and emphases of specified management or disturbance treatments emphasized (see Chapter 3).

There is a concern that some prescriptive standards are not appropriate at the scale of

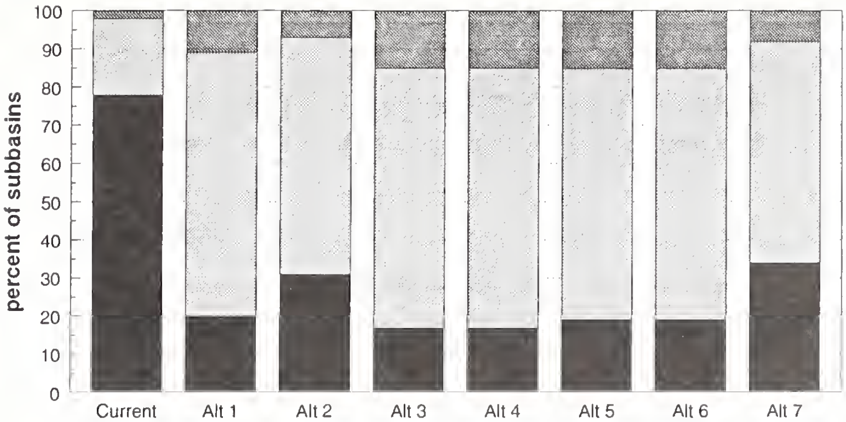
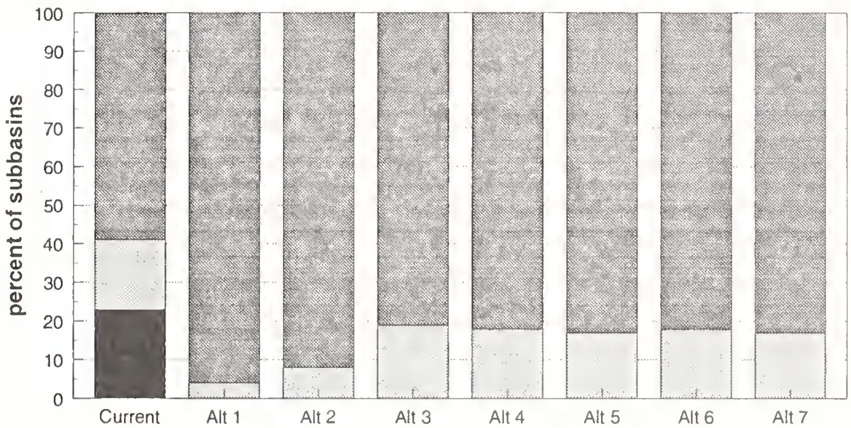


Figure 4-3. Lower Montane Early Seral Forest Departures from Historical Range of Variability, Year 100, in the Project Area. (Source: Quigley, Lee, and Arbelbide 1997).

Figure 4-4. Lower Montane Mid-Seral Forest Departures from Historical Range of Variability, Year 100, in the Project Area. (Source: Quigley, Lee, and Arbelbide 1997).



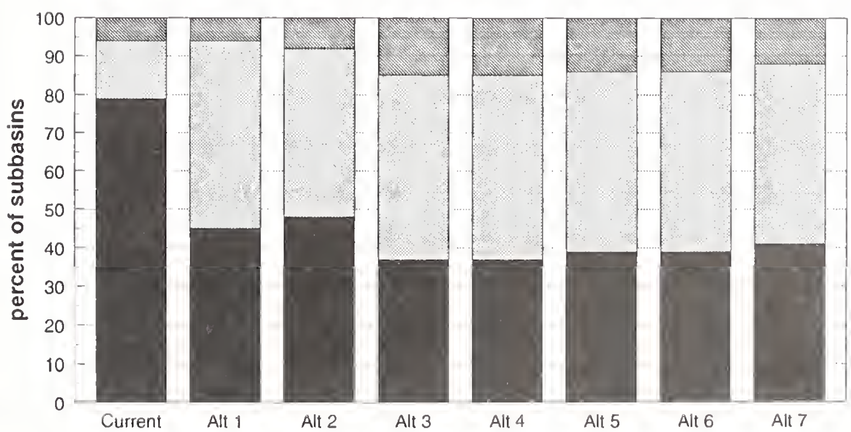


Figure 4-5. Lower Montane Late Seral Forest Departures from Historical Range of Variability, Year 100, in the Project Area. (Source: Quigley, Lee, and Arbelbide 1997).

Below HRV | Within HRV | Above HRV

Below HRV: Percent of subbasins with less of this community type than would be expected in HRV.

Above HRV: Percent of subbasins with more of this community type than would be expected in HRV.

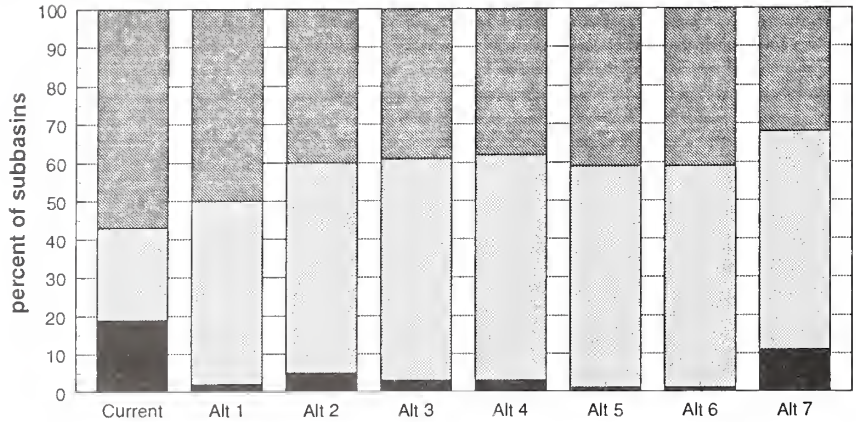


Figure 4-6. Montane Mid-Seral Forest Departures from Historical Ranges of Variability, Year 100, Project Area. (Source: Quigley, Lee, and Arbelbide 1997).

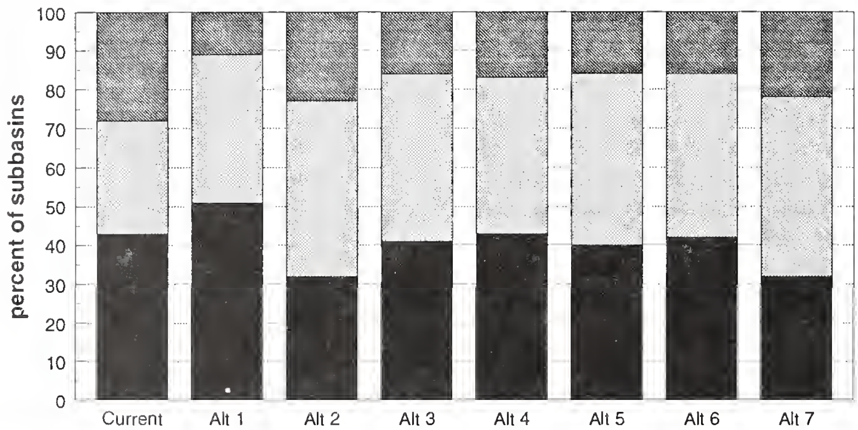


Figure 4-7. Montane Early Seral Forest Departures from Historical Ranges of Variability, Year 100, Project Area. (Source: Quigley, Lee, and Arbelbide 1997).

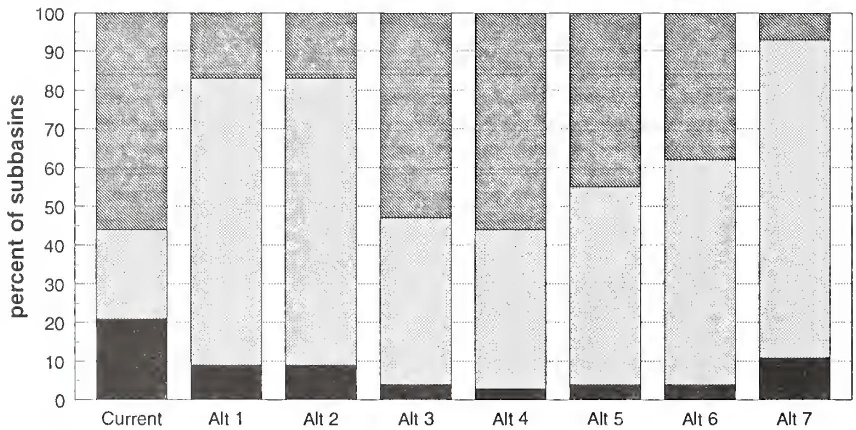


Figure 4-8. Subalpine Early Seral Forest Departures from Historical Ranges of Variability, Year 100, Project Area. (Source: Quigley, Lee, and Arbelbide 1997).

Below HRV — Percent of subbasins with less of this community type than would be expected in HRV.

Within HRV

Above HRV — Percent of subbasins with more of this community type than would be expected in HRV.

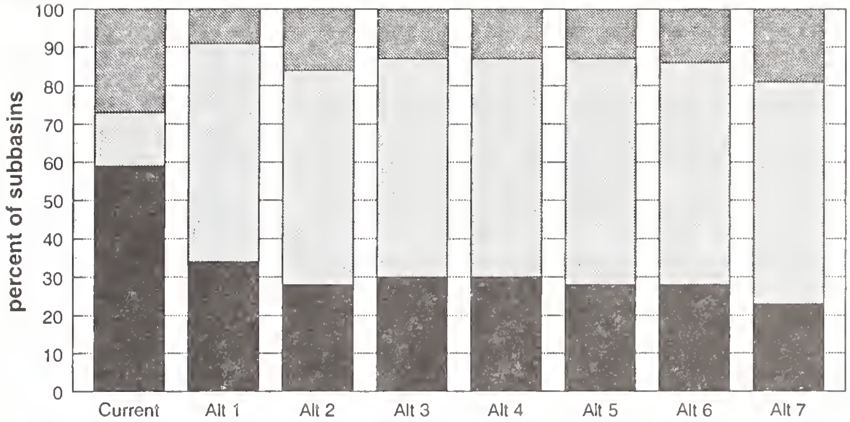


Figure 4-9. Montane Late Seral Forest Departures from Historical Ranges of Variability, Year 100, Project Area. (Source: Quigley, Lee, and Arbelbide 1997).

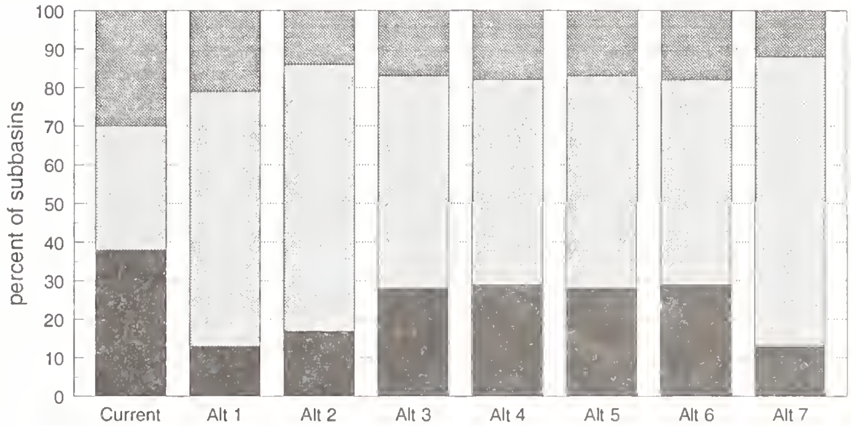


Figure 4-10. Subalpine Mid-Seral Forest Departures from Historical Ranges of Variability, Year 100, Project Area. (Source: Quigley, Lee, and Arbelbide 1997).

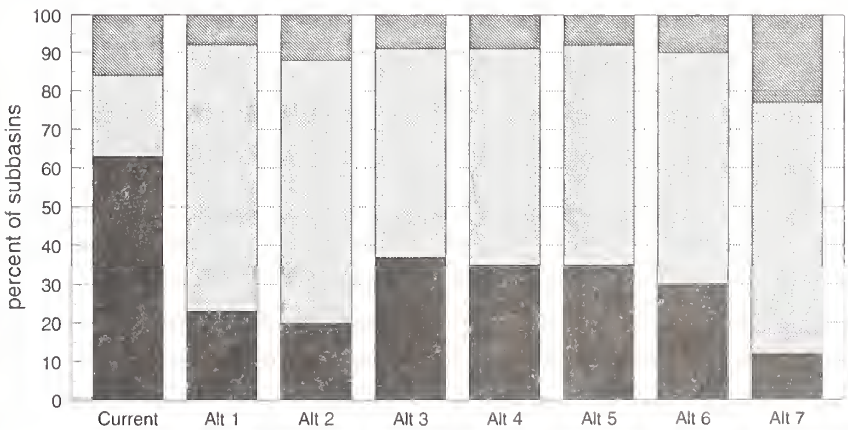


Figure 4-11. Subalpine LateSeral Forest Departures from Historical Ranges of Variability, Year 100, Project Area. (Source: Quigley, Lee, and Arbelbide 1997).

Below HRV — Percent of subbasins with less of this community type than would be expected in HRV.

Within HRV

Above HRV — Percent of subbasins with more of this community type than would be expected in HRV.

Table 4-17. Landscape Level Patterns[1] (Landscape Level Response and Trends), Project Area.

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Relative Response[2]	N	N	M	H	M	H	LM
Trend[3]	(--)	(--)	(-)	(++)	(-)	(+)	(-)
Explanation	-large amounts of terrestrial communities have structure and composition inconsistent with biophysical environment -traditional management has created high risk situations	-large amounts of terrestrial communities have structure and composition inconsistent with biophysical environment -traditional management has created high risk situations	-low emphasis on rapid fitting of standards to biophysical environments -prioritizes local issues rather than multi-scale ecosystem relationships	-highest probability and trend for repatterning landscapes to biophysical environments	-low emphasis on rapid fitting of standards to biophysical environments -prioritizes local issues rather than multi-scale ecosystem relationships	-high probability and trend for repatterning landscapes to biophysical environments	-unpredictable within reserves -outside reserves, similar to Alt 3

[1] Landscape level response to relative repatterning emphasis refers to the ability of alternatives to create patterns more consistent with biophysical environments, based on desired ranges of future conditions (DRFCs), Alternative Themes in Chapter 3, relative types of management (traditions vs. ecological), and disturbance treatments.

[2] Response ratings: H = high, M = moderate, L = low, N = none

[3] Trend ratings (current to future): (0) = stable projected trend, (+) = upward projected trend, (-) = downward project trend.

Source: Adapted from Quigley, Lee, and Arbelbide (1997).

this project area. These standards, such as buffer widths, tree diameters, five-year regeneration requirements, patch size, and old growth classifications that were determined at broad scales instead of the more appropriate scales such as those associated with landforms or plant associations, would likely produce negative effects on landscape patterns and ecosystem health in the long term. These standards would result in systematic recurring patterns on the landscape as they were implemented through time. Over time, as these patterns became more prevalent, the effects on ecosystem processes and species would become more pervasive. In many cases the effects would dominate landscape patterns and disrupt basic ecologic processes, resulting in the decline of other desired attributes of forest composition and structure.

Alternatives 4 and 6 have the highest potential to repattern landscapes because of their emphasis on restoring terrestrial communities to the desired range of future condition, and an emphasis on multi-scale ecosystem analysis and scientific study to assess landscape patterns conducive to restoration and maintenance of historical disturbance regimes. Although all alternatives use interim standards to provide direction for many fine-scale landscape attributes, Alternatives 4 and 6 emphasize the use of multi-scale analysis to determine more appropriate fine-scale management standards to replace those values.

Alternatives 1 and 2 have the lowest probability and trend toward restoration and maintenance of historical disturbance regimes due to their emphasis on traditional management, which has contributed to current high-risk conditions. For example, many late-seral multi-layer forests are located on steep slopes that have high potential for crown fires. Historically, these forest structures were located on moist footslope landforms where the risk of crown fires was not as high. Additionally, Alternative 1 has many standards that were developed to promote or sustain commodity development. These interim standards have resulted in landscape simplification. Alternative 2 has many additional standards for aquatic and riparian conservation. These standards have resulted in the development of systematic, reoccurring patterns not well suited to the characteristic biological and physical conditions and disturbance regimes. The widespread effect of Alternatives 1 and 2, due to traditional management methods, would change relationships between the biophysical environment and landscape pattern, resulting in landscapes that are at high risk to large-scale disturbance events, such as wildfire.

Alternative 3, through "local fixes", would not have a high emphasis on rapid fitting of standards to the biophysical conditions and prevailing succession/disturbance regimes at mid and fine scales. It would provide some context to determine desired multi-scale landscape patterns. This alternative would tend to emphasize local participation in land management planning.

Alternative 5, with an economic efficiency emphasis, would not result in rapid fitting of standards to the biophysical conditions and prevailing succession/disturbance regimes at mid and fine scales. It would provide some context for multi-scale landscape analysis. This alternative would tend to prioritize management actions on landscapes that have higher potential for economic benefits.

Alternative 7 within reserves would tend to be unpredictable relative to landscape dynamics and future landscape patterns due to current conditions in conjunction with passive management, and the effects of wildfire, the primary agent of change. Outside reserves, landscapes would respond similarly as they would to Alternative 3. Overall, Alternative 7 would not have a high emphasis on rapid fitting of standards to the biophysical conditions and prevailing succession/disturbance regime at mid and fine scales. It would provide some context for multi-scale landscape analysis.

More detailed discussion can be found in the Landscape Ecology section of the *Evaluation of Alternatives*.

Effects on Successional and Disturbance Regimes of Forest Communities

Effects of the alternatives on forest community successional and disturbance regimes are described in terms of: 1) primary successional transitions for terrestrial communities, 2) effects on fire regimes, 3) effects on insects and disease disturbance, and 4) relative abilities to resemble natural disturbance processes.

Successional Transitions

A net transition refers to the primary change(s) of one community into another, for instance, succession of mid-seral into late-seral multi-layer forest, "minus" the transitions of other communities into its class (early-seral into mid-seral). Tables 4-18 through 4-24 display projected successional processes and net transitions among forested terrestrial communities. The primary, or most common, net transitions described can be tied directly to the geographical extent and trends in terrestrial communities and subbasins (figures 4-1 through 4-9) discussed earlier. The alternatives differ in the management actions and other probable disturbance processes that cause trends in and transitions between forested communities. Projected transitions for subalpine mid-seral and late-seral communities do not differ significantly among alternatives, and are not included here. More detailed discussion can be found in the Landscape Ecology section of the *Evaluation of Alternatives*.

Lower montane early-seral forest (table 4-18): Most transitions into this terrestrial community occur from late-seral multi-layer forest in all alternatives. In Alternatives 1 and 2, this transition is caused by traditional harvest practices and/or wildfire. This results in early-seral structures with uniform spacing and size, relatively small patch sizes, or associated effects from salvage logging. Alternatives 3, 4. 5, 6, and 7 (outside reserves) use harvest and prescribed fire to cause this transition. Alternatives 4 and 6 attempt to more closely resemble ecological disturbance processes, creating stand structures and composition closer to historical conditions. Alternative 3 results in forest structure and composition that are in some cases uniform, and in other cases more like Alternatives 4 and 6. Alternative 5 is similar to Alternative 1 in timber priority areas. Alternative 7 (outside reserves) is similar to Alternative 3. In Alternative 7 (within reserves) wildfire is the predominant cause of the transition of late-seral multi-layer to early-seral, and in general may cause some relatively large patch sizes in the short term.

There is a general lack of emphasis in all alternatives for management of herb, shrub, and exotic plant communities within the lower montane forest (dry forest PVG). Historically, early-seral conditions in this type occurred on steeper landforms with climate and topography that supports either a relatively frequent fire interval that maintained upland herb, shrub, and early-seral communities, or a less frequent crown-fire regime that would cycle mid-seral communities. Current early-seral communities in lower montane (dry forest PVG) are typically in the wrong location for the fire regime. Past cutting patterns have created these types on benches or ridges which historically were in a relatively frequent underburning regime that maintained park-like or savannah structures.

Harvest patterns and prescribed fires in Alternatives 1 and 2 would continue patterns formed by past management. Wildfire in Alternative 2 would tend to create this type in a different pattern, owing to fuel accumulation in the underburning regime areas. Harvest and prescribed fires in Alternatives 4 and 6 would repattern landscapes to conditions more consistent with the succession/disturbance regime. Alternative 6 would proceed at a slower activity rate, requiring more research than Alternative 4. Alternative 5 would generally not emphasize repatterning of this type. Alternative 3 would proceed at a very slow rate given the emphasis on local priorities. Alternative 7 (outside reserves) would be similar to Alternative 3 and would be relatively unpredictable within reserves. The abundance and distribution of exotic plant species would increase in lower montane forests without implementation of monitoring and control efforts.

Lower montane mid-seral (table 4-19): Most transitions into this community structure occur from mid-seral (all alternatives), late-seral (Alternatives 1 and 2), and/or early-seral. In Alternatives 1 and 2, these transitions primarily occur due to fire exclusion and associated effects of insect, disease, and stress mortality of large or intermediate size trees in dense, multi-layer mid-seral or late-seral stands. With fire exclusion, many mid-seral communities in Alternatives 1 and 2 are remaining in that stage longer than expected for the biophysical environment, in a sense resulting in a "net transition" from mid-seral to mid-seral or no change. Mixed severity fires naturally thinned many of these mid-seral stands, accelerating succession toward late-seral conditions. Prescribed fire in Alternatives 3 through 7

Table 4-18. Primary Successional Transitions in Lower Montane Early-seral Forests.

Alternative	Action Causing Transition	Primary Net Transitions Initial TC	Resulting TC	Effects
1 and 2	harvest wildfire	late-seral multi-layer tolerant	early-seral intolerant	-Alt 1 structures similar to plantations - uniform spacing and size -Alt 2 small patches, associated associated salvage logging effects -early-seral locations inconsistent with biophysical environments -increase in exotic species
3, 5, and 7 (outside reserves)	harvest prescribed fire	late-seral multi-layer tolerant	early-seral intolerant	-Alt 3 some structures uniform, some more native -Alt 5 similar to Alt 1 in timber emphasis, similar to Alt 3 elsewhere -Alt 7 similar to 3 outside reserves -increase in exotic species
7 (within reserves)	wildfire	late-seral multi-layer tolerant	early-seral intolerant	-Alt 7 (within reserves) wildfire created structures, some very large patches -Increase in exotic species
4 and 6	harvest prescribed fire (resembling ecosystem processes)	late-seral multi-layer tolerant	early-seral intolerant	-Alts 4 and 6 more native structures and composition -early-seral locations more consistent with biophysical environments -increase in exotic species

These effects are for Forest Service- and BLM-administered lands only.

Abbreviations used in this table:
TC = Terrestrial Community type

Source: Adapted from Quigley, Lee, and Arbelbide (1997).

(outside reserves) would move mid-seral stands toward late-seral single-layer structure and cause fewer net transitions to mid-seral than Alternatives 1 and 2. Alternatives 4 and 6, by resembling ecological processes, would result in more historical structures and compositions than other alternatives.

Lower montane late-seral multi-layer and single-layer forest (table 4-20): Transitions to late-seral multi-layer forest primarily occur from mid-seral, or late-seral single-layer (Alternatives 1 and 2), or late-seral multi-layer forest (Alternatives 1 through 7 (outside reserves)). Alternatives 1 and 2 use selective harvest of large trees and fire exclusion to cause transitions to late-seral multi-layer forest. This would result in increased amounts of late-seral multi-layer forest with structures dissimilar to historical conditions; they would be more similar to mid-seral communities due to the selective harvest of large overstory trees, and would support high mortality risk (fire, insects, disease, stress). Alternatives 3 through 7 (outside reserves) would use harvest, prescribed fire, and/or thinning to move late-seral multi-layer communities toward late-seral single-layer. Alternatives 4 and 6 would result in more native-like structures and compositions than the other alternatives because of their emphasis on activities that resemble ecosystem processes.

Table 4-19. Primary Successional Transitions in Lower Montane Mid-seral Forests.

Alternative	Action Causing Transition	Primary Net Transitions Initial TC	Resulting TC	Effects
1 and 2	fire exclusion	mid-seral mid-seral	mid-seral late-seral multi-layer	-mortality of large, intermediate size trees due to stress, insect, and disease mortality
		late-seral	mid-seral	-associated effects of salvage logging
3, 4, 5, and 7 (outside reserves)	prescribed fire	mid-seral	late-seral single-layer	-less net transitions to mid-seral than Alternatives 1 and 2
4 and 6	harvest prescribed fire (resembling ecosystem processes)	early-seral mid-seral	mid-seral late-seral	-more native structures and compositions (live and dead standing, down trees) -less crownfire potential than 7 (within reserves)

These effects are for Forest Service- and BLM-administered lands only.

Abbreviations used in this table:
TC = Terrestrial Community type

Source: Adapted from Quigley, Lee, and Arbelbide (1997).

Montane early-seral forest (table 4-21): Transitions to montane early-seral forest primarily result from harvest, wildfire, or prescribed fire in mid-seral or late-seral multi-layer communities. Alternatives 2 through 7 would use genetically improved western white pine stock to regenerate some harvested areas to provide some recovery of this species where it has been lost to white pine blister rust. Causes and effects of transitions would be similar to those discussed for the lower montane early-seral community.

Montane mid-seral forest (table 4-22): Transitions to mid-seral forest primarily occur from early-seral (Alternatives 4 and 6) or mid-seral (all alternatives). Fire exclusion in Alternatives 1 and 2 would cause many mid-seral communities to remain in this condition longer than would be typical for the fire regimes, which historically would accelerate development toward late-seral structures through thinning effects. With fire exclusion, some mid-seral structures would develop into late-seral multi-layer communities. Prescribed fire in Alternatives 3, 5, and 7 (outside reserves) is the primary cause of predicted transitions to early-seral conditions. Alternatives 4 and 6 would use harvest and prescribed fire to resemble ecological processes and move early-seral communities toward mid-seral, and mid-seral toward late-seral single-layer and multi-layer forest in areas and with patterns that are more consistent with characteristic biological and physical conditions and disturbance regimes. Effects of these transitions would be similar to those discussed for the lower montane mid-seral community. Overall, activity levels within all the alternatives would not be sufficient to reverse current trends, which are maintaining or increasing amounts of mid-seral communities, although Alternatives 4 and 6 would reduce rates of increase more than other alternatives. Additionally, all alternatives would maintain a high likelihood of large crown fires due to areas of dense, multi-layer mid-seral, and late-seral communities.

Montane late-seral multi-layer and single-layer forest (table 4-23): Primary transitions

Table 4-20. Primary Successional Transitions in Lower Montane Late-seral Multi-layer and Late-seral Single-layer Forests.

Alternative	Action Causing Transition	Primary Net Transitions Initial TC	Resulting TC	Effects
1 and 2	selective harvest large trees	late-seral multi-layer	late-seral multi-layer	-increased amounts of late-seral multi-layer structures similar to native, and more like mid-seral. (dense) loss of large trees
	fire exclusion	mid-seral	late-seral multi-layer	-mortality risk (insects, disease, stress) high -fire risk high -net productivity declines
		late-seral single-layer	late-seral multi-layer	-associated effects of salvage logging -locations not consistent with biophysical environment
3, 5, and 7 (outside reserves)	harvest thinning prescribed fire	late-seral multi-layer	late-seral single-layer	-fewer net transitions to late seral multi-layer -more transitions to late-seral single-layer
4 and 6	harvest prescribed fire (resembling ecosystem processes)	late-seral multi-layer	late-seral single-layer	-more native compositions and structures (live, dead standing, down trees) -repattern locations to be consistent with biophysical environments

These effects are for Forest Service- and BLM-administered lands only.

Abbreviations used in this table:
TC = Terrestrial Community type

Source: Adapted from Quigley, Lee, and Arbelbide (1997).

of late-seral multi-layer would be to early-seral (Alternatives 1, 2, and 7 [within reserves]) and late-seral single-layer forest (Alternatives 3 through 7 [outside reserves]). Primary transitions to late-seral multi-layer would occur from late-seral single-layer or mid-seral (Alternatives 1 and 2). Alternatives 1 and 2 primarily emphasize harvest, wildfire, and fire exclusion to cause predicted transitions in these communities. Alternatives 3 through 6 and 7 (outside reserves) would use harvest, thinning, and prescribed fire to reduce amounts of late-seral multi-layer and increase amounts of lower montane late-seral single-layer forest. Alternatives 4 and 6 would use these methods to resemble ecological processes. Wildfire is the primary cause of predicted transitions from late-seral multi-layer to early-seral in Alternative 7 (inside reserves), although responses within reserves would be relatively unpredictable in the short term. Causes and effects of these transitions would be similar to those discussed for lower montane late-seral communities.

Most of the montane late-seral single-layer forest is found in moister areas of dry forest or drier areas of moist forest potential vegetation groups. The current amount of this terrestrial community structure is higher than that historically. Most of the land that currently supports this type historically supported lower montane late-seral single-layer forest (dominated by ponderosa pine, western white pine or western larch in moist environments, or lodgepole pine in cooler environments). The current structure (produced by selective harvest of large ponderosa pine, western larch and western white pine, and fire exclusion) is interim before shifting into mid-seral structures

Table 4-21. Primary Successional Transitions in Montane Early-seral Forests.

Alternative	Action Causing Transition	Primary Net Transitions Initial TC	Resulting TC	Effects
1	harvest wildfire	mid-seral late-seral multi-layer	early-seral	-uniform spacing and size (similar to plantations) -landscape location inconsistent with biophysical environment
2	wildfire some harvest	late-seral multi-layer mid-seral	early-seral	-small harvest units -associated effects of salvage logging -landscape locations inconsistent with biophysical environment
2 through 7	artificial regeneration	early-seral	early-seral with western white pine	recovery of some western white pine lost due to white pine blister rust
3, 5, and 7 (outside reserves)	harvest prescribed fire	mid-seral	early-seral	-Alt 3 and 7 structures between Alt 1 and 2 and 4 and 6 -Alt 5 structures similar to Alt 1 in timber emphasis, similar to Alt 3 elsewhere
4 and 6	harvest prescribed fire (mimicking ecosystem processes)	mid-seral	early-seral	-more native compositions and structures (live/dead standing and down trees) -landscape locations consistent with biophysical environments
7 (within reserves)	wildfire	late-seral multi-layer mid-seral	early-seral	-wildfire created structures
ALL				-not enough emphasis to restore role of large western white pine lost to white pine blister rust

These effects are for Forest Service- and BLM-administered lands only.

Abbreviations used in this table:
TC = Terrestrial Community type

Source: Adapted from Quigley, Lee, and Arbelbide (1997).

through mortality of the remaining overstory trees from stress, insects, or disease, or into multi-layer structures through regeneration of shade tolerant species in the understory. No alternative would implement activities sufficient enough to completely reverse the long-term decline of montane late-seral single-layer structures. Average decade activities to manage for this type would need to increase by about 50 percent, and there would need to be substantial emphasis placed on management for western white pine in more moist environments.

Subalpine early-seral forest (table 4-24): Primary transitions to early-seral forest are from late-seral (all alternatives). Alternatives 2 through 7 would use genetic improvement of whitebark pine planting stock to support recovery of whitebark pine lost to white pine blister rust. Transitions in Alternatives 1 and 2 would be caused by harvest and fire exclusion,

Table 4-22. Primary Successional Transitions in Montane Mid-seral Forests.

Alternative	Action Causing Transition	Primary Net Transitions Initial TC	Resulting TC	Effects
1 and 2	fire exclusion	mid-seral	mid-seral	-mortality of large, intermediate size trees due to stress, insect, disease mortality
		mid-seral	late-seral multi-layer	-associated effects of salvage logging
3, 5, and 7 (outside reserves)	prescribed fire	mid-seral	early-seral	-less net transitions to (outside mid-seral than Alternatives 1 and 2
7 (within reserves)	wildfire	mid-seral	early-seral	-lower amounts of mid-seral than Alternatives 3 through 6
4 and 6	harvest prescribed fire (resembling ecosystem processes)	early-seral mid-seral	mid-seral late-seral	-more native structures and compositions (live and dead, standing, down trees) -less crownfire potential than Alt 7 (within reserves)
All		overall		-activity levels not sufficient to reverse trends maintaining or increasing amounts of mid-seral, although 4 and 6 reduce rates of increase more than other alternatives -maintain current high levels of mid-seral, although 3 through 7 maintain less than 1 and 2 -maintain high likelihood of large crownfire events due to contagion of areas of dense, multi-layer mid-seral and late seral multi-layer

These effects are for Forest Service- and BLM-administered lands only.

Abbreviations used in this table:
TC = Terrestrial Community type

Source: Adapted from Quigley, Lee, and Arbelbide (1997).

and often would result in uniform structures and compositions, locations of early-seral communities inconsistent with biophysical environments, and lack of regeneration of shade-intolerant species. Alternatives 3 through 7 (outside reserves) would use prescribed fire and harvest to cause transitions from late-seral to early-seral, with similar effects as discussed for lower montane early-seral. Alternatives 4 and 6 attempt to resemble ecological processes, and may be more effective in restoring whitebark pine through providing suitable post-fire ash environments and blister rust resistant stock. Within reserves in Alternative 7, wildfire would be the major cause of predicted transitions between late-seral and early-seral communities, although responses within reserves would be relatively unpredictable in the short term. In all alternatives, there would be insufficient emphasis on restoration of whitebark pine lost due to white pine blister rust to recover native diversity in this type.

Table 4-23. Primary Successional Transitions in Montane Late-seral Multi-Layer Forests.

Alternative	Action Causing Transition	Primary Net Transitions: Initial TC	Primary Net Transitions: Resulting TC	Effects
1 and 2	harvest wildfire	late-seral multi-layer	early seral	-structures not consistent with biophysical environment
	fire exclusion	mid-seral late-seral single-layer	late-seral multi-layer mid-seral	-high mortality risk (insects, disease, snags) -loss of large trees -locations inconsistent with biophysical environments
3, 5, and 7 (outside reserves)	harvest thinning prescribed fire	late-seral multi-layer	late-seral single-layer	-increased net transitions to late seral single-layer, consistent with biophysical environments
4 and 6	harvest thinning prescribed fire (resembling ecosystem processes)	late-seral multi-layer	late-seral single-layer	-increase net transition to late-seral single-layer, consistent with biophysical environments -native composition and structures
7 (within reserves)	wildfire	late-seral multi-layer	early seral	-response unpredictable -high contiguous wildfire probabilities
All				-activity levels not sufficient to substantially reverse trends maintaining high amounts of multi-layer conditions, but Alts 3-6 have lower net transitions to this TC and are more proactive than 1, 2

These effects are for Forest Service- and BLM-administered lands only.

Abbreviations used in this table:
TC = Terrestrial Community type

Source: Adapted from Quigley, Lee, and Arbelbide (1997).

Effects on Fire Regimes

Probabilities of wildfire vary with cover type and structural stages, and change according to the management prescriptions within each alternative that affect forest composition and structure. An estimate of relative amounts of wildfire acres burned and the proportion of acres with crown fire was made from outputs of the CRBSUM (Keane et al. 1996 in Quigley, Lee, and Arbelbide 1997). The model estimated historical wildfire occurrence from a 400-year simulation, starting with historical vegetation conditions and using historical fire probabilities. The outputs for the seven alternatives are average hectares per decade of disturbance, based on a 100-year simulation. Current levels were derived from Year 10 of the simulation. Model outputs were adjusted for the effects of mid-scale pattern, and fine-scale live and dead vegetation and fuels composition and structure, as well as for overestimates in the modeled amount of management ignited prescribed fire (Hann et al. 1996, in Quigley, Lee, and Arbelbide 1997). Adjustment factors incorporate the concept of relative amounts of unburned area contained within wildfire perimeters that are caused by patterns of vegetation and fuel.

Table 4-24. Primary Successional Transitions in Subalpine Early-seral Forests.

Alternative	Action Causing Transition	Primary Net Transitions Initial TC	Resulting TC	Effects
1	harvest wildfire fire exclusion	late-seral	early-seral	-uniform spacing and size -locations inconsistent with biophysical environments -lack of regeneration of shade intolerant species
2 through 7	artificial regeneration	early-seral	early-seral with whitebark pine	-some recovery of whitebark pine lost to blister rust
2	wildfire some harvest fire exclusion	late-seral	early-seral	-small harvest units -associated salvage logging effects -locations inconsistent with biophysical environments -lack of regeneration of shade intolerant species
3, 5, and 7 (outside reserves)	harvest prescribed fire	late-seral	early-seral	-Alt 3 structures between 1 and 4 and 6 -Alt 5 structures similar to 1 in timber emphasis
4 and 6	harvest prescribed fire (resembling ecosystem processes)	late-seral	early-seral	-more native composition and structures (live, dead standing and down trees) -landscape locations consistent with biophysical environments
7 (within reserves)	wildfire	all	early-seral	-response unpredictable
All				-insufficient emphasis on restoration of whitebark pine lost due to blister rust

These effects are for Forest Service- and BLM-administered lands only.

Abbreviations used in this table:
TC = Terrestrial Community type

Source: Adapted from Quigley, Lee, and Arbelbide (1997).

Adjusted estimates of total acres burned under each alternative and potential vegetation group were compared to historical burned acre estimates obtained from the model. Ratios of acres burned under the different alternatives to the historical period were obtained for the dry, cold, and moist forest potential vegetation groups, where most of the burned forest occurs (table 4-25).

The CRBSUM outputs were adjusted to account for the effects of finer-scale patterns of live and dead vegetation, fuels compositions and structures, and overestimates in the modeled amount of management-ignited prescribed fire (Hann et al. 1996). Adjustment factors also incorporated the typical amounts of unburned area contained within wildfire perimeters that resulted from irregular vegetation and fuel patterns.

Estimates of acreage burned by crown fires (as opposed to surface fires) were developed by applying a classification based on species group and crown closure to the vegetation burned in year 100 of the simulations of historical and potential future conditions. This classification was best-suited for estimating the percentage of wildfires that would become crown fires within the dry forest potential vegetation group. The

Table 4-25. Net Acres Burned by Wildfire (Projected: Historical), UCRB Planning Area.

PVG	Historical Acres[1]	Current	Alternatives 1	2	3	4	5	6	7
					percent				
Cold Forest	443,376	101	113	116	59	51	73	69	107
Dry Forest	1,377,976	41	41	42	22	19	24	23	67
Moist Forest	833,879	57	63	65	39	35	43	40	68

This table displays the ratio of estimated net acres burned by wildfire each decade to estimated historical acres (after 100 years). This data is for Forest Service- and BLM-administered forestlands in the UCRB planning area.

[1] Acres per decade

Abbreviations used in this table:
PVG = potential vegetation group

Source: Adapted from ICBEMP GIS data and associated databases (1 km² raster data), and Quigley, Lee, and Arbelbide 1997.

percent of wildfires estimated to be surface fires was calculated by subtracting the crown fire percentage from 100 percent (table 4-26).

To better illustrate the relative extent of the planning area to be affected by crown and surface fires in dry forests, the ratio of crown fires and surface fires to total wildfire was multiplied by the estimated percentage of the planning area that burns each decade, then divided by the historical wildfire percentages. This provided a ratio of estimated acres burned by surface and crown fires (for current conditions and for each alternative) to historical acres burned by these types of fires historically (table 4-27).

These simulation results (tables 4-25 through 4-27) are the basis for the following discussions of likely consequences of the alternatives on wildfire. However, there are important modeling limitations. For example, CRBSUM is limited by the user's ability to account for substitution or overlap of prescribed fire, thinning, and harvest activities – the primary drivers of wildfire effects. Treatments proposed in the alternatives could be conducted on the same sites; for example, an area could be burned several years after it was thinned, or a sequence of prescribed fires could be conducted over a short time on the same area to incrementally reduce fire hazard without harming dominant overstory trees. For the Draft EIS, simulation of the alternatives did not provide sufficient detail to solve such modeling limitations. Prior to publishing the Final EIS, there may be model refinements to account for these more complex treatment scenarios, which could adjust interpretations of differences among alternatives and their comparison to historical patterns of wildfire. Nevertheless, the present simulations offer a relative basis for alternative comparison.

Effect on Wildfire Acres

For the cold forest PVG in the planning area, projections for Alternatives 3 through 6 yielded fewer burned acres than current levels, with the lowest amount in Alternative 4 (table 4-25). The amount of wildfire estimated for Alternatives 1, 2, and 7 would be greater than current levels, and all three are projected to have more net burned acres than historical estimates.

For the UCRB area, all alternatives would have fewer acres burned in dry and moist forests than historically (table 4-25), with the greatest

Table 4-26. Percentage of Dry Forest Burned by Surface and Crown Fires, UCRB Planning Area.

PVG	Historical	Current	Alternatives 1	2	3	4	5	6	7
					percent				
Surface Fires	67	47	26	20	35	36	35	27	21
Crown Fires	33	53	74	80	65	64	65	73	79

This table displays the ratio of estimated net percentage of acres burned by wildfires (after 100 years) that are surface or crown fires in the dry forest potential vegetation group for the UCRB planning area on Forest Service- and BLM-administered lands.

Abbreviations used in this table:
PVG = potential vegetation group

Source: Adapted from ICBEMP GIS data and associated databases (1 km² raster data), and Quigley, Lee, and Arbelbide 1997.

Table 4-27. Ratio of Dry Forest Burned by Surface and Crown Fires, UCRB Planning Area.

	Historical Acres[1]	Current	Alternatives 1	2	3	4	5	6	7
					percent				
Surface Fires	925,828	29	16	12	12	10	12	9	21
Crown Fires	452,149	65	94	104	43	37	48	50	161

This table displays the ratio of net acres of dry forest burned by surface fires and crown fires to historical acres on Forest Service- and BLM-administered lands in the UCRB planning area.

[1] Acres per decade

Source: Adapted from ICBEMP GIS data and associated databases (1 km² raster data), and Quigley, Lee, and Arbelbide 1997.

reduction in dry forest of all forested potential vegetation groups. The lowest estimated burned acreage would occur under Alternatives 3, 4, 5, and 6, compared to that historically in dry forest, and the range among alternatives is quite small — 19 to 24 percent. These lower levels of estimated burned acres may relate to the management emphasis on restoring late-seral single-layer stand structures, which would increase the potential effectiveness of fire suppression. There would be little difference between Alternatives 1 and 2 for dry forest, although they would have about twice as much wildfire as Alternatives 3 through 6. Alternative 7 would have quite a bit more fire, about 67 percent of that historically, and about 25 percent more than current and Alternatives 1 and 2.

For moist forest, Alternatives 3 through 6 would have the lowest amount of projected wildfire, a range of 35 to 43 percent of historically burned acres. Alternative 5 may be somewhat higher than Alternatives 4 and 6 because areas with timber management priority in Alternative 5 may result in a higher proportion of the area in mid-seral stand structures, which have a higher level of fire risk. Alternatives 1, 2, and 7 would be similar to current estimates of wildfire acres, 63, 65, and 68 percent. This flammability may be caused by a lack of restoration treatments in mid-seral stands that established in the early 1900s, and in which most fires have been excluded to the present time. The lack of suppression in reserves in Alternative 7 would also contribute to the higher burned area estimates.

Effect on Crown Fire Occurrence

The amount of area burned by wildfires would be less than it was historically for dry and moist forest for all alternatives. However, a clear idea of the wildfire trend cannot be gained without also considering the ratio of crown fires to wildfires. The CRBSUM is not extremely sensitive to mid- and fine-scale changes within forested vegetation, such as in composition, structure, and pattern that cause increased crown fire potential. This is particularly true for moist and cold forest, within which crown fire potential can increase significantly in an area that would still be classified as the same cover type and structural stage. The dry forest had the highest relative differences in crown fire potential and, therefore, was used as an indicator of differences among alternatives.

While the CRBSUM estimated substantial decreases in wildfire acreage, the crown fire model suggested that all alternatives would have a larger decrease in area burned by surface fires than in area burned with crown fires. It is estimated by the model that historically 67 percent of the UCRB dry forest burned with surface fires (table 4-26). This is a similar conclusion to estimates made by comparing historical and current fire regimes (Morgan et al. 1996), where the nonlethal and mixed severity fire regime was present in 92 percent of the dry forest in the historical period, and only 8 percent of the area would have burned with lethal, stand-replacing fires. Surface fires in dry forest were usually nonlethal to the dominant overstory, maintaining the open, park-like stands characteristic of ponderosa pine forests on benches and ridges, and generally controlled forest density on most dry forest sites.

Model results estimated that all alternatives would have a larger proportion of wildfire acres that burn with crown fires in dry forest than occurred historically, 33 percent (table 4-26). Alternatives 3, 4, and 5 would be closest to the historical proportion of crown fires of the alternatives, but all would show increases from the current estimated level of 53 percent crown fire. However, the location of fires in Alternatives 3 and 4 are better fitted to the landscape patterns than Alternative 5. Alternatives 1, 2, 6, and 7, have even higher ratios of crown fire: 74, 80, 73, and 79 percent of the total. Alternative 6 has higher departure than Alternative 4 because of slower implementation of restoration activities in the first decade.

Because burned acres would be less than that historically in all alternatives for dry forest, a comparison was made of the relative amounts of wildfire burned by surface fires and crown fires within the EIS area by alternative to historical amounts (table 4-27). All alternatives would show a substantial reduction in the amount of surface fire compared to the historical amount, in which an estimated 925,800 acres of surface fire burned in dry forest per decade. Alternatives range from 10 to 21 percent of the estimated historical surface fire acreage.

However, the estimated area of dry forest that would burn with crown fire varies considerably

among alternatives. Alternatives 3 through 6 would have 43 to 50 percent of the acres of crown fire that occurred historically. Alternatives 1 and 2 would have about the same net percent of the EIS area burning with crown fire in dry forest as occurred historically, but these crown fire percentages would be accompanied by very low percentages of surface fire. For Alternative 7, about 161 percent of the wildfire acres would burn with crown fire compared to historical estimates of crown fire acres. Most of the wildfire that would occur in dry forest in Alternatives 1, 2, and 7 would likely kill the stand. The relatively high amounts of crown fire in Alternatives 1, 2, and 7 could relate to the greater amounts of late-seral multi-layer forest in these alternatives, about twice that projected for Alternatives 3 through 6.

Fire suppression could result in fewer acres burned than historically, with the exception of Alternative 7 for cold forest. However, not enough active management would be done to reduce crown fire potential to historical proportions in Alternatives 3 through 6, even though they would have much more restoration activities than currently occur. Most of the areas with serious wildland/urban interface fire problems are located in association with dry forest. This would continue to be a serious problem under all alternatives, unless a priority were placed on forest restoration treatments, including fuel management, in wildland/urban interface areas. Management-ignited prescribed fire would replace a proportion of the surface fire in dry forest in Alternatives 3 through 7 (figure 4-12), although mortality higher than desired could occur when stands are initially entered with prescribed fire after decades of fire exclusion.

A very high proportion of wildfire acres in dry forest in Alternatives 1, 2, and 7 would be crown fires in areas that would likely burn with much less of a mosaic pattern than occurred historically. Crown fires can be accompanied by high amounts of consumption of surface fuel, including all size classes from twigs to coarse woody debris, and litter and duff layers. Much more extensive soil heating, to higher temperatures at deeper depths, can result. It is not known what effects this significant change in fire regime would cause over the long term. It is unknown whether dry forest ecosystems would recover over a very long timeframe to species, structures, and fire regimes that are characteristic for each site over a very long timeframe.

Discussion and Conclusions

All alternatives would have less wildfire than occurred historically because wildfires were not suppressed historically. Among the action alternatives, burned acreage would be highest under Alternative 7, because of the presence of reserves. The model assumed that fire suppression action would occur only where fires threatened reserve boundaries, and essentially no actions would be taken within reserves to reduce flammable forest structures and fuels. Alternatives 3 through 6 would have lower levels of wildfire than Alternatives 1, 2, and 7 because there is much greater emphasis in Alternatives 3 through 6 on forest restoration and management actions that would reduce the

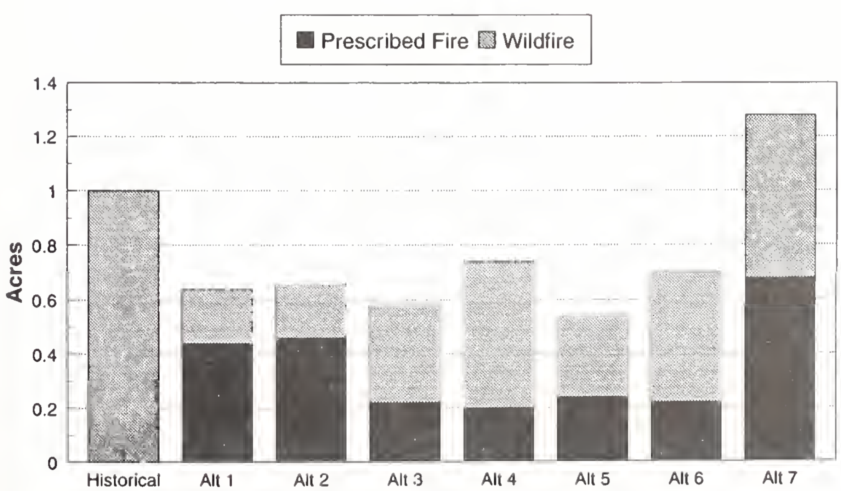


Figure 4-12. Relative Disturbance from Wildfire and Prescribed Fire, Dry Forest, UCRB Planning Area.

amount area of cover type/structural stages with higher wildfire occurrence probabilities. Alternatives 3 through 7 have much more prescribed fire than Alternatives 1 and 2, and Alternative 7 would have much less proposed harvest and thinning than Alternatives 3 through 6. Additionally, Alternatives 3 through 6 have much more emphasis on restoration of vegetation patch size and pattern. Alternatives 4 and 6 are most likely to repattern landscapes to their characteristic biological and physical conditions.

Harvest, thinning, and management-ignited prescribed fire actions often target late-seral multi-layer, and mid-seral lower montane and montane forest communities, often with the intent of reducing stand density and re-establishing dominance by a single forest canopy layer. Actions would tend to favor fire-tolerant, shade-intolerant species. Activity fuels generated by forest management activities would generally receive treatment to reduce flammability. Landscape level prescribed fire, both from management and natural ignitions, would restore natural processes to some extent. Appropriate post-fire rehabilitation actions would reduce the flammability of early-seral stands, and allow them to begin development toward a low density, single-layer forest, which is much less flammable than mid-seral or multi-layer forests.

However, no alternative would have a high enough level of active restoration to reverse wildfire trends. Wildfire, insects, disease, and stress would continue to have a major effect on forest vegetation, even in Alternatives 4 and 6, which have the highest level of restoration activities.

Effects on Insects and Disease

Table 4-28 displays the relative effects of alternatives on insect and disease susceptibility by forested potential vegetation type between historical, current, and projected 100-year conditions. In general, insect and disease susceptibility is tied to forest structure and composition, and landscape pattern. Forested communities with the highest composite insect and disease susceptibility are generally those with mid-seral closed canopy or understory reinitiation structures, or those with late-seral multi-layer structures. The net change index displayed in table 4-28 is a combination of changes in broad-scale forest composition and structure, mid-scale pattern, and fine-scale live and dead vegetation composition and structure from current and historical conditions. In general, the effects on insect and disease susceptibility are likely to be underestimated since modeling methods did not take into consideration susceptibility of a location due to its adjacency to an existing infected location.

Currently, areas with high insect and disease susceptibility in the dry forest PVG (lower montane and some parts of the montane terrestrial communities) are 53 percent greater than historically. Under Alternatives 1, 2, and 7, the dry forest potential vegetation group would continue their historical to current increasing trends in high insect and disease susceptible forest communities, due to increasing trends in mid-seral communities, greater relative increases in late-seral multi-layer communities, and relatively low emphasis on thinning in Alternatives 2 and 7. Alternatives 3 and 4 would show the greatest decreases in high susceptibility compared to current due to greater emphasis on harvest and thinning.

Currently, area in high insect and disease susceptibility condition in the moist forest potential vegetation group (lower montane and some parts of the montane and subalpine terrestrial communities) is 122 percent greater than historically. All alternatives would show a reversal of historical to current increasing trends in high insect and disease susceptibility in the moist forest PVG. Alternatives 1, 2, and 7 would show the least decrease in susceptibility as a result of relatively greater increasing trends in late-seral multi-layer and lower relative amounts of harvest, thinning, and prescribed fire.

Currently, areas with high insect and disease susceptibility in the cold forest PVG (subalpine and some parts of the montane terrestrial community) is 108 percent greater than historically. In the cold forest PVG, all alternatives would reverse the historical to current increasing trend in high insect and disease susceptible forest communities. Alternative 4 would show the greatest decreases in susceptibility as a result of declining trends in mid-seral structure.

Table 4-28. Long-Term Change Index of Areas in High Insect and Disease Susceptibility Condition, UCRB Planning Area.

PVG	Terrestrial Forest Community	Reference Point	Current	Alternatives 1 100yr	2 100yr	3 100yr	4 100yr	5 100yr	6 100yr	7 100yr
Dry Forest	Lower Montane and Montane	Change from historical	53	145	161	30	13	44	40	117
		Change from current	-	60	71	-15	-26	-6	-8	42
Moist Forest	Montane and Subalpine	Change from historical	122	59	64	32	18	34	31	67
		Change from current	-	-28	-26	-40	-47	-39	-41	-25
Cold Forest	Subalpine	Change from historical	108	95	84	36	19	52	41	73
		Change from current	-	-6	-11	-34	-43	-26	-32	-16

This table displays the net change index of areas with high susceptibility to insects and disease. The change is from historical to current to projected (100 years) conditions on Forest Service- and BLM-administered land in the UCRB planning area.

Abbreviations used in this table:
PVG = potential vegetation group

Source: Adapted from ICBEMP GIS data and associated databases (1 km^2 raster data) and Quigley, Lee, and Arbelbide 1997.

Ability to Resemble Natural Forest Disturbance

Table 4-29 displays percent of the ICBEMP area affected by direct forest disturbance (prescribed fire, wildfire, thinning, harvest) per decade at the broad scale. Table 4-30 displays the relative abilities of the alternatives to resemble or represent ecological disturbance. Alternatives 1 and 3 through 6 generally would directly disturb the same percentage of the project area per decade as was disturbed historically (about 30 percent), while Alternative 2 would disturb less area (about 20 percent) per decade in the short and long term. However, when evaluating the relative ability of each alternative to resemble or represent natural forestland disturbance processes, as shown in table 4-30, greater differences among alternatives emerge. Alternatives 4 and 6 generally resemble or closely resemble/ represent natural forest disturbance processes through prescribed fire and/or thinning. Alternatives 3, 5, and 7 (outside reserves) diverge from natural disturbance processes due to local priorities, or to goals for economic efficiency. Alternatives 1, 2, and 7 generally do not resemble/represent natural forest disturbance processes due to less use of prescribed fire than Alternatives 3 through 6, the implementation of traditional fire and fuel treatment that focus on fuels reduction rather than resembling natural disturbance processes, or due to potentially large, high severity wildfires (Alternative 7 within reserves) that do not resemble natural fire regimes in the short term.

Cumulative Effects

Table 4-31 summarizes and integrates major conditions and trends as they relate to forested community structure and composition.

In the Interior Columbia Basin project area, it is expected that up to a 20 percent increase in commodity production on non-Federal lands would occur in Alternative 7 due to a reduction in commodity production on about 50 percent of Forest Service/BLM-administered lands (in reserves).

Table 4-29. Percent of Area Affected by Direct Forest Disturbance, UCRB Planning Area.

		Alternatives						
Projection	**Historical**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
10 year	21	18	13	24	23	22	22	18
100 year	21	18	14	24	24	23	22	18

This table displays the percent of Forest Service- and BLM-administered lands in the UCRB planning area that are affected by direct forest disturbance (prescribed fire, wildfire, thinning, harvest) at the broad scale.

Source: ICBEMP GIS data (1 km^2 raster data).

Table 4-30. Ability of Disturbances to Resemble Natural Processes in Forestlands, UCRB Planning Area.

	Alternatives							
	1	2	3	4	5	6	7 within reserves	7 outside reserves
Relative Rating	0	0		+	-	++	0	-
Explanation	-less prescribed fire than Alts 3-7 -thinning and prescribed fire treatments traditional (fuel reduction)	-less prescribed fire than Alts 3-7 -prescribed fire treatments traditional (fuel reduction)	-prescribed fire aims to resemble ecological fire processes -thinning and harvest achieve some prescribed fire objectives -local priorities drive activities -"minimal fix" of existing plans	-prescribed fire aims to resemble ecological fire processes -thinning and harvest achieve some prescribed fire objectives	-prescribed fire aims to resemble ecological fire processes -thinning and harvest achieve some prescribed fire objectives -emphasizes economic efficiency	-prescribed fire aims to resemble ecological fire processes -thinning and harvest achieve some prescribed fire objectives -technology development supports ecological treatments	-amount of wildfire highest -large, high severity fires do not resemble ecological regimes	-less prescribed fire than 3-6, more than 1 and 2 -prescribed fires aims to resemble ecological fire processes -thinning and harvest achieve some prescribed fire objectives

This table shows the relative ability of broad-scale actions in each alternative to resemble natural ecological processes in Forest Service or BLM in the UCRB planning area.

(0) = does not resemble/represent natural ecological disturbance
(-) = diverges from natural ecological disturbance
(+) = resembles/represents natural ecological disturbance
(++) = closely resembles/represents natural ecological disturbance

Source: Adapted from Quigley, Lee, and Arbelbide (1997).

Table 4-31. Major Trends in Forestland Conditions, UCRB Planning Area.

Conditions and Trends	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
Interior ponderosa pine decrease across its range, with significant decrease in the amount of old single story structures. Primary transitions were to Douglas-fir and grand fir/ white fir.	Continued decline due to traditional harvest and fire exclusion		Amount of this type (Late seral ponderosa pine single layer forest Terrestrial Community) increases on BLM/FS close to the historic level over a 100 year period with thinning and prescribed fire. Difficult to achieve in wilderness and semi-primitive areas unless a fairly active prescribed fire program is used.				Within reserves-similar to Alt. 2. Outside reserves-similar to Alt. 3 except resulting in only ½ the amount projected for Alt.3
	Transition to late multi or mid seral would continue with high mortality of large and intermediate trees from stress, insect, disease, wildland fires along with associated effects of salvage logging.		Relatively high levels of net transitions to late single. Pattern similar to regime associated with biophysical template of this type.				Within reserves-similar to Alt. 2 Outside reserves-similar to Alt 3.
	Tend to produce late multi or mid-seral communities in place of late single community.		Somewhat between traditional structures of Alts 1&2 and ecological structures of Alts 4&6 depending on local priority and degree of ecological emphasis.	Emphasis on resembling ecosystem processes with harvest, thinning, & prescribed fire would produce late single structures closest to native composition and structure for live and dead standing, down trees.	High production areas would be similar to Alt. 1 and other areas would be similar to Alt. 3. Limitations related to economic priorities create a moderate ability to emphasize repatterning of this type.	Same as Alt. 4 except would proceed at slower rate with more energy put into technology development.	Within reserves-this type would be cycled with prescribed natural fire. Outside reserves-similar to Alt. 3.
	No management emphasis for this type.		Focus for thinning, harvest, and fuel treatments is in ERUs 7, 9, 10, 11, 12, and 13.	Prescribed natural fire would play primary role with some associated harvest, thinning, & prescribed fire treatments in ERUs 6, 7, 9,12, & 13. Thinning, harvest, and fuel treatments to reduce risk of wildfire would be prioritized in ERUs 6,7,12 & 13. Moderate emphasis on thinning, harvest, and fuel treatments in ERUs 7,9-13. Low emphasis in ERUs 7,8,10-13.	Some focus on this type, but it would be prioritized in ERUs 7-13.	Same as Alt. 4.	Within reserves-no management emphasis. Outside reserves similar to Alt. 3.

Western larch decreased across its range. Primary transitions were to interior Douglas-fir, lodgepole pine, or grand fir/ white fir.	Some increase in late single but does not achieve historical levels	Some increase in late single but does not achieve hisorical levels	Generally achieve late single by year 50 but then declines as succession and wildfire interact with this type (Late seral montane single layer forest Terrestrial Community), mid seral stage, and late multi. Possible to maintain historic but average decade of activities to manage need to increase by about 50 percent and need substantial emphasis placed on managing western white pine. To achieve this type in wilderness and semi-primitive areas, its assumed that a fairly active prescribed natural fire program is used.	Within reserves- late single continues to shift to late multi but wildfire would shift many to early seral communities. Late multi has a steep decline similar to Alt. 1 and is affected primarily by prescribed natural fire. Outside reserves- late single is similar to Alt. 3. Late multi has similar curve as Alt. 3 and is affected primarily by harvest, thinning, and prescribed fire.
Western white pine has decreased 95 percent across its range. Primary transitions were to grand fir/ white fir, western larch, and shrub/ herb/tree regeneration.	Least increase in late multi over 100 years in response to harvest and wildfire.	Increases in late multi similar to restoration emphasis in Alts 3-6.	Substantial increases in the late multi type (Late seral montane multi layer forest Terrestrial Community) to well above the historic level in response to harvest, thinning, and prescribed fire, along with associated effects of wildfire.	
	Transition from late single to late multi and mid seral stages increases slightly then declines. The transition to mid seral will be associated with high mortality of large and intermediate size trees from stress, insect, disease, wildfire, and associated effects of salvage logging. Reduces transition to late multi the most after achieving historic levels, but continues to crease structures not in sync with the basic disturbance regime.	Transition from late single to late multi and mid seral stages are similar to Alts. 3-6 but at lower levels.	The late single is generally stablilized with some fluctuation.	Within reserves- Less decline of late single. Response of late multi is highly unpredictable because the probabilities for large contiguous wildland fires in this community were substantially underestimated. Outside reserves- Late single and multi response is similar to Alt. 3
		Slight decrease in rate of transition to late multi.	Slight decrease in rate of late multi because not enough area is treated to substantially change the trend due to large amount of mid seral that is transitioning to this type. Substantial increases in the transitions to the late single community. Pattern is similar to the regime associated with the biophysical environment of this type.	

For all alternatives, the overall pattern in the future on the dry end of the moist forest and the moist end of the dry forest is one that will be associated with high mortality of large and intermediate size trees from stress, insect, disease, wildland fire, and associated effects of salvage logging.

Table 4-31. Major Trends in Forestland Conditions (continued), UCRB Planning Area.

Conditions and Trends	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
(continued from previous page)							
Western larch decreased across its range. Primary transitions were to interior Douglas-fir, lodgepole pine, or grand fir/ white fir. **Western white pine has decreased 95 percent across its range. Primary transitions were to grand fir/ white fir, western larch, and shrub/ herb/tree regeneration.**	Tends to produce late multi communities which are very dense with high mortality in response to fire exclusion or communities without large old trees due to effects of harvest.		Somewhat between traditional structures of Alts 1 & 2 and ecological structures of Alts 4 & 6 depending on local priority and degree of ecological emphasis.	Emphasis on resembling ecosystem processes with harvest, thinning, and prescribed fire would produce late seral single and multi structures closest to native composition and structure for live and dead standing/ down trees. Late single communities would also emphasize regenerating shade intolerant species such as western white pine, western larch, and lodgepole pine.	High production areas would be similar to Alt. 1 and other areas would be similar to Alt. 3 for late single and multi communities. Limitations related to economic priorities create a moderate ability to emphasize repatterning of this type.	Same as Alt. 4 but at slower rate with more energy put into technology development.	Within reserves- this type would be cycled with prescribed nature fire. Outside reserves - similar to Alt. 3.
	No management emphasis for late single. Restoration is less proactive than Alts 3-7. Disturbances for late multi are scattered throughout all ERUs.		Emphasis for thinning, harvest, and fuel treatments in the late single and multi communities would be in ERUs 5,7,9,11-13.	Prescribed natural fire program would play primary role in late single and multi communities with some associated harvest, thinning, and prescribed fire treatments in ERUs 6,7,9,12-13. Thinning, harvest, and fuel treatments to reduce risk of wildfire would be prioritized in ERUs 6,7,12-13. Moderate emphasis on thinning, harvest, and fuel treatments in ERUs 5,7,9,11-13. Low emphasis in 5,7,8,11-13.	Some focus but prioritized in ERUs 5, 7-9, 11-13.	Same as Alt. 4.	Within reserves - No management emphasis for these types. Outside reserves - similar to Alt. 3

Whitebark pine/ alpine larch potential vegetation type has decreased 95% across its range, primarily through a decrease in the alpine larch component. Overall, pure whitebark pine stands have decreased, with compensating increases in Engelmann spruce/subalpine fir.	The late single communities decline well below historical levels at about the same rate for all alternatives. Most of this type is wilderness and semi-primitive areas.					
					Alt. 6 has higher potential than other alternatives for technology development and progress to higher levels of prescribed natural fire in in late single communities.	
	All alternatives show an increase in late multi communities to historical levels within 50 years.					
	Alternatives 1 and 2 show steady increase above historical level by year 100.	Alternatives 3 through 6 increase to historical levels by year 50 and level out through year 100.				Within reserves - late multi is fairly unpredictable given dynamic nature of fire. Outside reserves- similar to Alt. 3.
	Traditional harvest and fire exclusion would increase levels of the late single and multi structures which are out of sync with its basic disturbance regime, particularly in the 50-100 year period for late multi communities.	Substantial action is not taken for late single communities relative to prescribed natural fires during the weather conditions that could be used to provide for this disturbance regime. Late multi communities would be between traditional structures of Alt 1 and ecological structures of Alts 4&6 depending on local priority and ecological emphasis.	Substantial action is not taken for late single communities relative to prescribed natural fires during the weather conditions that could be used to provide for this disturbance regime. Emphasis on resembling ecosystem processes with harvest, thinning, and prescribed fire would produce late seral multi structures closest to native composition and structure for live and dead standing/down trees.	Substantial action is not taken for late single communities relative to prescribed natural fires during the weather conditions that could be used to provide for this disturbance regime. Little emphasis on resembling ecosystem processes with harvest, thinning, and prescribed fire would produce late seral multi structures closest to native composition and structure for live and dead standing/down trees.	Same as Alt. 4.	Within reserves- response of late single and multi structures over the long term would be similar to historic structures however dynamic nature of wildland fire may preclude development of mid-seral structures. Outside reserves- late single and multi are similar to Alt. 3

Table 4-31. Major Trends in Forestland Conditions (continued).

(continued from previous page)

Conditions and Trends	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
Whitebark pine/ alpine larch potential vegetation type has decreased 95% across its range, primarily through a decrease in the alpine larch component. Overall, pure whitebark pine stands have decreased, with compensating increases in Engelmann spruce/ subalpine fir.	Disturbance and treatments for late single and multi would be generally be scattered throughout all ERUs.		Emphasis areas based on local priorities.	Prescribed natural fire program would play primary role in late single and multi communities with some associated harvest, thinning, and prescribed fire treatments in ERUs 6,7,9,12-13. There would not be substantial emphasis in other ERUs due to the low composition of the cold forest and higher priorities through all alternatives on improving conditions in the dry and moist PVGs.	Some focus on this type.	Same as Alt. 4.	Within reserves- No management emphasis for these types. Outside reserves- similar to Alt. 3.
Mid-seral forest structures have increased in dry and moist forest PVGs with a loss of large scattered residual shade-intolerant tree components and an increase in density of smaller diameter shade tolerant trees.	Mid seral ponderosa pine terrestrial community shows a strong increase primarily on BLM/FS lands but also somewhat comparable to management on other lands. Mid seral montane shows a general decline to year 50 then levels out at about historic levels at year 100. Primary factor is succession to late multi for both dry and moist PVGs.		Mid seral ponderosa pine community generally is maintained at current levels with harvest, thinning, and prescribed fire along with the associated effects of wildfire. Mid seral montane shows a general decline to year 50 then levels out at about historical levels at year 100. Primary factor is succession to late multi for both dry and moist PVGs.				Within reserves-- mid seral ponderosa pine is similar to Alt 2. Mid seral montane is similar to Alts. 1-6. Outside reserves- mid seral ponderosa pine is similar to Alt. 3. Mid seral montane is similar to Alts. 1-6

Mid seral ponderosa pine community continues transition of upland herb, early-seral, and late seral to mid seral and maintains much of mid seral (generally transitions to itself or late multi).		Mid seral ponderosa pine community has much lower levels of net transitions to mid seral and are generally to late single. Pattern is similar to regime associated with BPT of this type. Maintains amount on BLM/FS similar to current and substantially above historical levels.				Within reserves- mid seral ponderosa pine community is similar to Alt. 2. Mid seral montane community has wildland fire converting some of the type to early seral. There would be less of this type than Alts. 3-6. Outside reserves- Mid seral ponderosa and montane are similar to Alt. 3.
Mid seral montane generally transition to itself or to late multi. High mortality of large and intermediate size trees from stress, insect, disease, and wildfire, and associated effects of salvage logging are associated with the transitions of both mid seral montane and ponderosa pine communities.		Mid seral montane community has much lower levels of net transitions to mid seral and late seral stages with an increased transition to early seral. Lower amounts of this type exist by the year 100 than Alts 1&2.				
Produces mid seral communities similar to tree farms with uniform spacing and size for both mid seral ponderosa pine and montane communities. Tradional harvest and fire exclusion continues to create structures not in sync with the basic disturbance regime.	Produces stands of high density and small dead standing and down trees with patches similar to Alt 1. Tradional harvest and fire exclusion continues to create structures not in sync with the basic disturbance regime.	Somewhat between traditional structures of Alts 1&2 and ecological structures of Alts 4&6 depending on local priority and degree of ecological emphasis. Proceeds at varying rates based on local emphasis.	Emphasis on resembling ecosystem processes with harvest, thinning, and prescribed fire would produce mid seral ponderosa pine and montane sructures closest to native composition and structure for live and dead standing/down trees.	High production areas would be similar to Alt. 1 and other areas would be similar to Alt. 3. Limitations related to economic priorities create a moderate ability to emphasize repatterning of this type.	Same as Alt. 4 except would proceed at slower rate with more energy put into technology development.	Within reserves- mid seral ponderosa pine has structures created by wildfire. Mid seral montane is highly dynamic and variable in response to wildfires. Outside reserves- similar to Alt. 3 for bot mid seral ponderosa pine and montane communities.

Table 4-31. Major Trends in Forestland Conditions (continued).

Conditions and Trends	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
(continued from previous page)							
Mid-seral forest structures have increased in dry and moist forest PVGs with a loss of large scattered residual shade-intolerant tree components and an increase in density of smaller diameter shade tolerant trees.	Disturbance and treatments for mid seral ponderosa and montane communities would generally be scattered throughout all ERUs.		Emphasis for thinning, harvest, and fuel treatments in the late single and multi communities would be in ERUs 5, 7, 9, 11-13.	Prescribed natural fire program would play primary role in late single and multi communities with some associated harvest, thinning, and prescribed fire treatments in ERUs 6, 7, 9, 12-13. Thinning, harvest, and fuel treatments to reduce risk of loss from wildland fire would be prioritized in ERUs 6, 7, 12-13. Moderate emphasis on thinning, harvest, and fuel treatments in ERUs 5,7,9,11-13. Low emphasis in ERUs 5,7,8,11-13.	Some focus but prioritized in ERUs 5, 7-9, 11-13.	Same as Alt. 4.	Within reserves-disturbances would generally be scattered throughout all clusters. Outside reserves-would be similar to Alt. 3.
Loss of the large tree component (live and dead) within roaded and harvested areas. This decrease affects terrestrial wildlife species closely associated with these old forest structures.	Tradional harvest and fire exclusion continues to create structures not in sync with the basic disturbance regime.		Somewhat between traditional structures of Alts 1&2 and ecological structures of Alts 4&6 depending on local priority and degree of ecological emphasis. Proceeds at varying rates based on local emphasis.	Emphasis on resembling ecosystem processes with harvest, thinning, and prescribed fire would produce late seral single and multi structures closest to native composition and structure for live and dead standing/down	High production areas would be similar to Alt. 1 and other areas would be similar to Alt. 3. Limitations related to economic priorities create a moderate ability to emphasize repatterning of this component.	Similar to Alt. 4.	Within reserves-the large tree component would be cycled with prescribed natural fire. Outside reserves-similar to Alt. 3.

This table applies to the UCRB planning area.

Adapted from Quigley, Lee, and Arbelbide 1997.

Rangelands

Assumptions

The following major assumptions were made by the Science Integration Team during their evaluation of alternatives:

Rangeland Vegetation

- Technology is presently available that can produce desirable grazing systems and range restoration results in forest, range-riparian, cool shrub, and woodland potential vegetation groups.

- The modeled 100-year projection of the geographic extent of exotic vegetation probably is overestimated for Alternative 2.

Summary of Key Effects and Conclusions

- Alternatives 4 and 3 are predicted to be the most effective in reducing the spread of noxious weeds and cheatgrass on rangelands, in general, in the project area. Alternatives 6 and 7 would be the next most effective, followed by Alternative 5, with Alternatives 2 and 1 being the least effective. No alternative was predicted to reduce the acres of infestations on dry grassland, overall. Alternatives 3 and 4 were predicted to decrease the acres of noxious weed infestations, in general, on the dry and cool shrublands. Differences among alternatives are due to differing management activity levels and the differing emphases of control efforts, related to the number of acres treated and the areas or range clusters and noxious weed species treated. Alternative 4 proposes the most acres of noxious weed control and the most emphasis of implementation of the IWM strategy; therefore, it is projected to be the most effective alternative with regard to noxious weeds and cheatgrass.

- Alternatives 4, 3, 6, and 5 are predicted to be the most effective in reducing the encroachment or density of woody species on rangelands, in general, in the project area. Alternative 7 would be the next most effective, and Alternatives 2 and 1 would be the least effective. It is predicted that Alternative 4 and possibly Alternative 3 would meet the desired range of future condition with regard to reducing woody species encroachment or density problems, generally. Differences among alternatives are due to differing management activity levels and differing emphases of control efforts, related to the number of acres treated and the areas or range cluster where acres were treated. Alternative 4 proposes the highest amounts of prescribed burning and harvesting of woody species; therefore it is predicted to be the most effective with regard to woody species encroachment or density.

- Alternatives 4, 3, and 6 are predicted to be the most effective in restoring acres of rangeland vegetation types, in general, in the project area. Alternative 7 would be the next most effective, followed by Alternative 5, with Alternatives 2 and 1 being the least effective. These alternatives would not have an effect of restoring rangeland vegetation types on non-Federal lands. The ranking of alternatives was based on the predicted ability of an alternative to restore rangeland vegetation types that have been taken over by noxious weeds or by woody species such as juniper on BLM- or Forest Service-administered lands. Reasons for this ranking are similar to those for noxious weeds and woody species control.

- Alternatives 4 and 6 would be predicted to be the most effective in reducing fragmentation and loss of connectivity on rangelands, in general, in the project area. Alternative 7 would be the next most effective, followed by Alternative 3, with Alternatives 5, 2, and 1 being the least effective. It is predicted that restoration activities would be undertaken under the action Alternatives (3 through 7) with consideration of fragmentation and connectivity issues prior to implementation of most restoration activities. Standards and guidelines would be the most effective in Alternatives 4 and 6 for reducing fragmentation and loss of connectivity with regard to implementing management actions that do not cause further problems and that reduce existing problems.

- Alternatives 4, 6, and 7 are predicted to be the most effective in restoring slow-to-recover rangelands (that are not infested with exotics), in general, in the project area. Alternative 3 would be the next most effective, followed by Alternative 5, with Alternatives 2 and 1 being the least effective. Restoration activities would be done through range vegetative improvements as well as livestock management improvements, which are the highest in Alternatives 3 and 4 for range improvements and highest in Alternatives 4 and 6 for livestock management improvements.

- Alternatives 7, 4, and 6 would be predicted to be the most effective in reducing wildlife displacement and vulnerability to mortality on rangelands, in general, in the project area. Alternative 3 would be the next most effective, followed by Alternative 5, with Alternatives 2 and 1 being the least effective. There would be predicted effects on road closure, road use, and human activity as a result of implementation of some alternatives, especially Alternative 7, which would be predicted to reduce wildlife displacement and vulnerability to mortality through reserves.

- The amount of wildfire is much less than historical levels because of fire suppression actions, with the exception of the dry shrub PVG in Alternatives 1, 2, and 7. For all PVGs, Alternatives 3, 4, 5, and 6 have lower levels of wildfire than the other alternatives.

The SIT believes the objectives for Alternative 2 are quite similar to those for Alternative 1 ~ at least those that pertain to the dispersal and control of exotic plants. Consequently, values of exotic weeds, upland shrubland, and upland herbland communities were adjusted to be similar to those of Alternative 1.

Discussion ~ The EIS Team made the assumption that all results regarding rangeland vegetation were the same for Alternatives 1 and 2 because the interim direction that applies in Alternative 2 (but not Alternative 1) does not significantly affect rangeland vegetation.

- The current amount of exotic vegetation was probably underestimated using remote sensing. Consequently, it is highly probable that exotics would increase to higher levels than projected with the Columbia River Basin Successional Model (CRBSUM) simulations.

  Discussion ~ The EIS Team agreed with the hypothesis that at the fine scale the amounts of exotic weeds are much higher than was able to be mapped at the broad scale. The projected trends for exotics will depend upon the interaction of the alternative, the range cluster, and the rangeland potential vegetation group (see Effects on Noxious Weeds section later in this chapter). See the first assumption in the Noxious Weeds Assumptions section.

- The diversity and productivity of native plant communities at the fine scale has been reduced by the history of excessive livestock grazing. However, changes in range management practices over the past 20 to 40 years have improved the state of rangeland vegetation. Through time, the integrity of dry grass, cool shrub, and dry shrub groups will improve.

Discussion ~ This assumption relates to rangeland integrity at watershed or larger scales (the SIT ranked Alternatives 1 and 2 as "low" for achieving landscape rangeland integrity [see table 4-12]). The EIS Team assumed, in addition, that rangeland integrity could be improved through the cumulative effect of management actions taken at finer scales. The EIS Team also noted that integrity is affected by exotic vegetation; therefore, rangeland condition or integrity may not necessarily improve under all alternatives when considering exotics.

- Grazing regimes typically will be implemented to resemble the types of grazing to which the dominant decreaser (species most palatable and preferred by grazing animals, and that tend to decrease under grazing pressure) native grasses and forbs are adapted. Typically this results in short-duration, low to moderate utilization, with emphasis on higher utilization levels during the dormant seasons.

  Discussion ~ There are exceptions in the case of seeded areas, especially areas seeded with crested wheatgrass, where grazing might not be implemented in a manner that fosters maintenance of decreaser native herbs. Some crested wheatgrass seedings need relatively heavy grazing pressure to reduce the presence of plants with tall dead stems and to sustain forage production. Higher utilization levels during the dormant season would be consistent with Alternatives 3 through 7 direction and promote protection of the soil resources by leaving residual matter.

- Current Forest Service and BLM land use plans (Alternatives 1 and 2) rely on systematic livestock grazing systems. In Alternatives 3 through 7, there will be more emphasis on systematic grazing during the dormant season, with monitoring of grazing more closely during the growing season in order to resemble native grazing regimes and to improve the competitive ability of native perennial grasses against exotic annuals and perennials.

In addition to the SIT assumptions, the EIS Team also assumed the following:

- The results of CRBSUM runs for rangelands (see the Rangelands Methodology section later in this chapter) were used in Chapter 4 for their value in the relative ranking (comparison) of alternatives. The relative differences among alternatives were believed to be accurate, but the actual acreage of terrestrial communities predicted for each alternative were not accurate because current amounts of exotics were

underestimated. Exotic weeds, wildfire, and prescribed burn acres that were simulated with CRBSUM for Alternatives 3 through 7 are useful for comparisons of trends among alternatives but have low accuracy in amounts by potential vegetation group.

Noxious Weeds

The following assumptions are based on the understanding that remote sensing of vegetation did not accurately portray the historical or current geographic extent of noxious weeds. Because those data were used as inputs for the Columbia River Basin Successional Model (CRBSUM), the outputs from CRBSUM were also inaccurate. Therefore, the evaluation of noxious weeds and cheatgrass did not use the CRBSUM outputs for exotics.

- The SIT's evaluation assumed that projected exotic weed extent would vary, according to (1) the alternative, (2) the range cluster, and (3) the rangeland potential vegetation group under consideration. The noxious weed portion of Chapter 3 was set up so noxious weed control would vary by the management emphasis (Conserve, Restore, or Produce) of each range cluster within each alternative; consequently, the exotic weed extent sometimes could decrease in 100 years for some clusters under some alternatives.

- Integrated Weed Management (IWM), described in Chapter 3, would be applied to all lands. The steps of Integrated Weed Management are expected to be implemented on all lands, but the assumption was made that noxious weeds would continue to encroach upon BLM- or Forest Service-administered lands from other lands, in all alternatives and all range clusters.

- Remote sensing did not accurately portray the current extent of exotic weeds in the project area, primarily because the broadleaved exotic forb species (for example, the knapweed complex) could not be detected from aerial photos and satellite imagery, and the exotic annual grasses, for example cheatgrass and medusahead, could not be detected where they were an understory component or in small patches (less than 160 acres).

- All rankings between 20 and 30 in Table 4-36 (later in this chapter) represent prevention of further infestation of rangeland potential vegetation groups (dry grass, dry shrub, or cool shrub) by noxious weeds; the higher the ranking, the higher the amount of the potential vegetation group restored. In other words, in 100 years, at least some of the potential vegetation group would be restored if the rank is greater than 20. All rankings of 20 or less represent further weed infestation; as the rank decreases toward 0, more of the potential vegetation group would be infested by weeds.

- Some of the acreage proposed for Livestock Management activities in Table 3-7 would include acreage proposed for noxious weed control within the Improve Rangelands activity. If this assumption is not met, there is a relatively higher risk of reinvasion by noxious weeds of sites that have received control, compared with sites that have received control but lack post-control livestock management. The Livestock Management activity is pertinent to Step 7 (Proper Range Management) and Step 2 (Preventing Weed Encroachment) of Integrated Weed Management.

- Some areas within the Prescribed Burning activity in Table 3-7 would include burning for weed control. For example, prescribed burning could control of medusahead, especially if it is conducted just prior to seed ripe.

- Weed species presented in the range cluster tables, predicted effects tables in the *Evaluation of Alternatives*, and Chapter 4 tables are not the only weeds that will be targeted for weed control. Species referred to in these tables were those assessed in the Scientific Assessment. Other noxious weeds undoubtedly are present in the project area and should be the target for weed control (IWM) efforts if they are found. Cheatgrass is not legally declared noxious in the project area, but the assumption is made here that the alternatives and the IWM strategy would pertain to cheatgrass as if it were a noxious weed. The acreage listed in the Improve Rangelands portion of Table 3-7 are assumed to apply to cheatgrass.

- The midpoint of the range of acres presented in the Improve Rangelands activity in Table 3-7 is the highest estimated number of acres that would be treated for weed control, because other activities are included in the Improve Rangelands category. The acreage scheduled for noxious weed control was assumed to be within the Improve Rangelands activity, and was assumed to pertain to each decade for the next 100 years.

- Integrated weed management efforts would be emphasized in high human process disturbance areas, which typically include roaded areas, waterways, campgrounds, and trails.

- In Alternative 7, noxious weeds that are already present in reserves would continue their spread, although at a slower pace than in those outside reserves. Some reserves, especially in Range Cluster 4, contain fragmented habitat, are relatively small, and are often surrounded by agricultural and other private land. Even though IWM was assumed to be implemented on other lands, it is assumed that weeds would invade and spread into reserves at greater rates in areas of fragmented ownership compared to less fragmented, more contiguous blocks of land in reserves.

Causes of the Effects of Each Alternative on Rangelands

Rangeland effects were projected for 100 years using CRBSUM. The model used the interactions of several effects to come up with the landscape analysis of the alternatives. It is the combination of these elements and the effects they have on rangelands and each other that produced the effects of the implementation of the seven alternatives. The following is a list of these six main causes:

- grazing effects;
- rangeland vegetation improvements;
- prescribed fire;
- exotics;
- wildfire; and
- succession.

The fire regime in Range Potential Vegetation Groups is different than it was historically because of changes in plant community composition and structure related to our management actions. These include:

- wildfire suppression;
- loss of fine fuels, which were a primary carrier of fire, due to livestock grazing; and
- establishment of flammable exotic plants.

The trend in the amount and type of wildfire would vary among alternatives primarily because of differences in the amount of prescribed fire. Some amount of fire exclusion still would be apparent within alternatives, because wildfire suppression and livestock utilization of fine fuels continue to occur. No alternative would restore the natural disturbance process of fire relative to historical levels.

Methodology: How Effects on Rangelands were Estimated

The rangeland effects were estimated by the use of four sources: Landscape *Evaluation of Alternatives* by the Science Team (in Quigley, Lee, and Arbelbide 1997); *Effects of Planning Alternatives on Noxious Weeds and Cheatgrass in the Interior Columbia Basin and Portions of the Klamath and Great Basins* (Karl 1996, in Quigley, Lee, and Arbelbide 1997); the *Scientific Assessment* (Quigley, Graham, and Haynes 1996; Quigley and Arbelbide 1996); and professional judgement by the SIT and EIS Team.

The Landscape evaluation of alternatives was done by taking the objectives and standards of the alternatives (table 3-5), and the management activities in acres per decade (table 3-7), and modeling the results of implementation of these activities primarily using CRBSUM. Numerous assumptions were made that reflected the model outputs and the conclusions made about the results by the science team. Grazing effects, wildfire, prescribed burning, rangeland vegetation improvements, exotics, and succession were the effects modeled that produced the results.

Effects of noxious weeds were evaluated by considering the alternatives and their objectives and standards; management activities for noxious weed control; and rule sets established for each alternative in each range cluster. All of

these factors were used to come up with the amount of noxious weed control by cluster by alternative and the effect that amount of noxious weed control would have on the spread of noxious weeds. This information would then lead to a ranking of the alternatives in their effectiveness of noxious weed control and whether the alternative was successful in reducing the spread.

Estimates of total acres that would be burned by alternative and potential vegetation group were compared to historical estimates. Ratios of acres burned under the different alternatives to the historical period were calculated for the three rangeland potential vegetation groups — cool shrub, dry grass, and dry shrub — in which almost all of the burned acreage occurred on rangelands.

Professional judgement by the Rangeland staff on the SIT and EIS Team was used to take all the landscape evaluation information, the noxious weed evaluation, the *Scientific Assessment*, management prescriptions, and experience in rangeland systems to determine the final outcomes of the implementation of the alternatives. This required coordination with other SIT members, and identifying and discussing inaccuracies of the model runs (for example, noxious weeds and wildfire and prescribed fire were not accurately modeled and probably did not reflect the accurate implementation of the alternatives) with other EIS Team and SIT professionals.

Effects of the Alternatives on Rangelands

Introduction

The following discussion is structured similar to Chapter 2 "Affected Environment", to aid the reader in tracking between chapters. The *Evaluation of Alternatives* completed by the Landscape Ecology staff of the SIT was reported by physiognomic type and terrestrial community. However, the rangeland information in Chapter 2 of the EIS was reported by Potential Vegetation Groups (PVGs). Table 4-32 provides the reader a crosswalk to show which Physiognomic or Terrestrial Community group exists on the three major rangeland PVGs. Terrestrial communities are groups of cover types with similar moisture and temperature regimes, elevational gradients, structures, and use by vertebrate wildlife species.

The evaluation by the Landscape Ecology staff of the SIT was used in the overall analysis of the effects of the alternatives. To do the analysis, they used the CRBSUM to predict outcomes of key elements in 10, 50, and 100 years. Due to the extreme sensitivity of the model to changes to modeling criteria, there were three major inconsistencies that have significant implications for this chapter:

(1) Wildfire and prescribed burning were not modeled accurately by CRBSUM. Therefore, acreage figures for the major terrestrial communities, upland herbland, upland shrubland, upland woodland, and exotics may not be accurate.

(2) As stated previously, the extent and rate of spread of noxious weeds and cheatgrass in the project area were underestimated. In addition, the model probably did not accurately estimate ecological processes relating to exotic weeds. Modeled outcomes in conjunction with the *Evaluation of Alternatives* were used to address this inconsistency.

(3) With regard to effects on the four major terrestrial communities, Alternatives 1 and 2 should have the same results since the only difference between the two alternatives is PACFISH, INFISH, and Eastside screens. However, the model showed substantially different results between Alternatives 1 and 2. For this section, results for Alternative 1 will be used to describe the results for both Alternatives 1 and 2.

Although the terrestrial community acres reported in the tables may not be quantitatively accurate, they can be used to compare and rank the alternatives relatively with respect to restoring rangeland health.

Effects on Rangeland Distribution, Composition, and Structure

Terrestrial Communities

Table 4-33 displays the minimum and maximum historical, current, and 100-year projections by alternative for the four major

Table 4-32. Crosswalk Between Rangeland Potential Vegetation Groups and Terrestrial Communities.

Potential Vegetation Group	Physionomic/Terrestrial Community
Dry Grassland	Exotics Upland Herbland Upland Woodland
Dry Shrubland	Exotics Upland Herbland Upland Shrubland Upland Woodland
Cool Shrubland	Exotics Upland Herbland Upland Shrubland Upland Woodland

Source: Adapted from Quigley, Lee, and Arbelbide (1997).

rangeland terrestrial community groups. Alternatives 3 through 7 would reduce the geographical extent of exotics below the current levels within 100 years. Alternatives 1 and 2 would result in no change. All alternatives would result in an increase in upland herbland from current, with no significant difference between alternatives except Alternative 7, which would result in a somewhat higher than the others. All alternatives would result in the upland herbland being within historical, but Alternatives 1 and 5 fall barely within the low end of historical. All alternatives would result in a decrease in upland shrubland from current. All alternatives would result in the upland shrublands being within historical.

All alternatives would result in a significant increase of upland woodland above historical levels except for Alternative 7, which would achieve near the maximum for historical. This result on upland woodlands may be an inconsistency as a result of the low wildfire and prescribed fire acres modeled for the UCRB. However, the majority of the increase in upland woodlands was in the Central Idaho Mountains ERU as a result of conifer encroachment into steep, rough areas of minimal access. It is expected that minimal opportunity for conifer encroachment control in these areas would be taken. Upland woodlands in the other ERUs, in general, decreased. Overall, in relation to meeting or moving towards the desired range of future condition as a result of these projections, the action alternatives (3 through 7) would all be within the desired range of future condition with the possible exception of upland woodlands.

Figures 4-13, 4-14, and 4-15 display the percentage of sub-basins containing upland herbland (figure 4-13), upland shrubland (figure 4-14), and upland woodland (figure 4-15) that would be above, within, or below the historical range of variability in the project area for each alternative. Generally, there are no significant differences among the alternatives for upland herbland when compared to current conditions. For upland shrubland, all the alternatives would result in more subbasins below the historical range of variability when compared to current, with no subbasins above the historical range of variability. This was mostly due to prescribed burning, wildfire, and succession of upland shrubland into upland woodlands. For upland shrubland, all the alternatives would result in more subbasins below the historical range of variability when compared to current, with no subbasins above the historical range of variability. This was mostly due to prescribed burning, wildfire, and succession of upland shrubland into upland

Table 4-33. Percentage of Terrestrial Communities, UCRB Planning Area.

Terrestrial Community	Historical Minimum	Historical Maximum	Current	Alternatives 1	2	3	4	5	6	7
Exotics	0.0	0.0	2.9	2.9	4.7	0.7	0.7	1.9	0.8	1.1
Upland Herbland	6.9	12.7	5.8	7.0	5.5	8.0	8.3	7.0	7.8	10.0
Upland Shrubland	23.7	30.3	28.0	25.1	24.6	26.4	26.2	26.1	26.4	25.0
Upland Woodland	1.6	1.9	1.0	2.8	2.8	2.7	2.7	2.8	2.8	1.8

This table displays historical, current, and future (100 years) percentage of the four major terrestrial rangeland communities on Forest Service- and BLM-administered land in the UCRB planning area.

Source: Adapted from Quigley, Lee, and Arbelbide (1997).

woodlands. For upland woodland, all the alternatives would result in increases of the percent of subbasins above the historical range of variability and decreases in the percent of sub-basins below the historical range of variability when compared with current conditions. This was mostly due to the succession of upland shrublands into upland woodland and to conifer encroachment into hard-to-access areas for control treatments.

Table 4-34 displays the historical to current trends and the 10- and 100-year projections by alternative for the four major rangeland terrestrial communities. Future projections are expressed in relative percent change from current conditions. Alternatives 3 and 4 would reduce extent of exotic weeds in 10 years, and would substantially reduce the extent of exotic weeds from 10 to 100 years. Alternatives 5,6, and 7 are expected to have no change in the extent of exotic weeds in 10 years and a slight reduction in extent of exotic weeds from 10 to 100 years. Alternatives 1 and 2 are the only alternatives that would be expected to result in an increase in exotic weeds above current levels in 10 years and a substantial increase from 10 to 100 years.

All alternatives would be expected to substantially increase in upland herbland after 10 years, with the increase continuing to 100 years. There were few differences between alternatives in the increase of upland herbland. The main reason for the increase in upland herbland would be due to the conversion of exotic weeds to upland herbland in Alternatives 3-7 and the reduction of upland shrublands in Alternatives 1 and 2. No alternative would have significant changes on upland shrubland in the first 10 years. Alternatives 1 and 2 would be expected to have a slight decrease in upland shrubland over the 100-year period whereas the other alternatives would be expected to have no change from 10 to 100 years. All alternatives would increase the extent of upland woodlands in 10 years as well as from 10 to over 100 years. There were no significant differences between the alternatives in the predicted increase of upland woodlands.

Dry Grassland Potential Vegetation Group

The extent of the dry grassland communities moving toward the desired range of future condition would be expected to continue to decrease in the project area, in general, under all alternatives. The causes would be the continued invasion and spread of existing infestations of noxious weeds into these communities and the encroachment of conifers under Alternatives 1 and 2. Under Alternatives 3 through 7, noxious weed encroachment would be slowed as compared with Alternatives 1 and 2, but conversion of these plant communities to noxious weeds would still occur, more so under

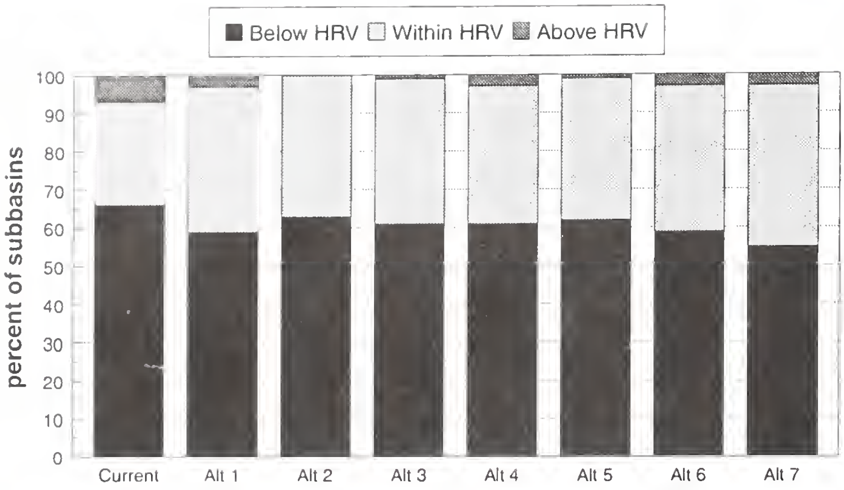


Figure 4-13. Upland Herb, Above/Within/Below Historical Ranges in Variability, Project Area.

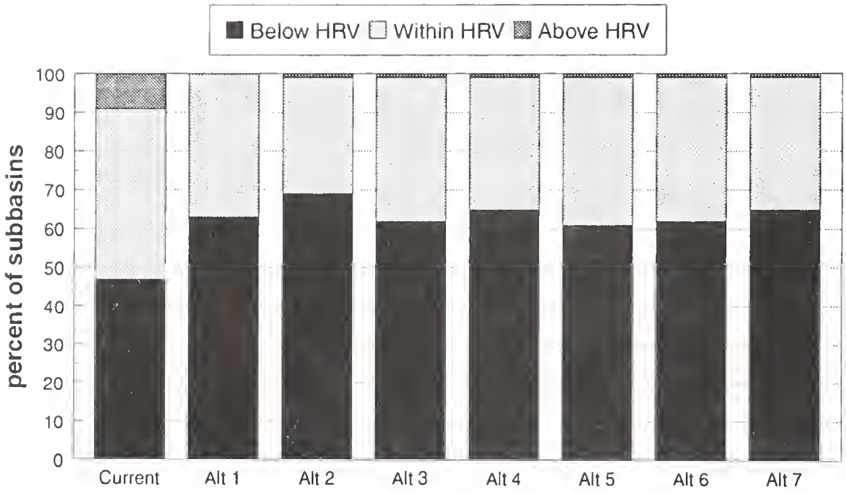


Figure 4-14. Upland Shrub, Above/Within/Below Historical Ranges in Variability, Project Area.

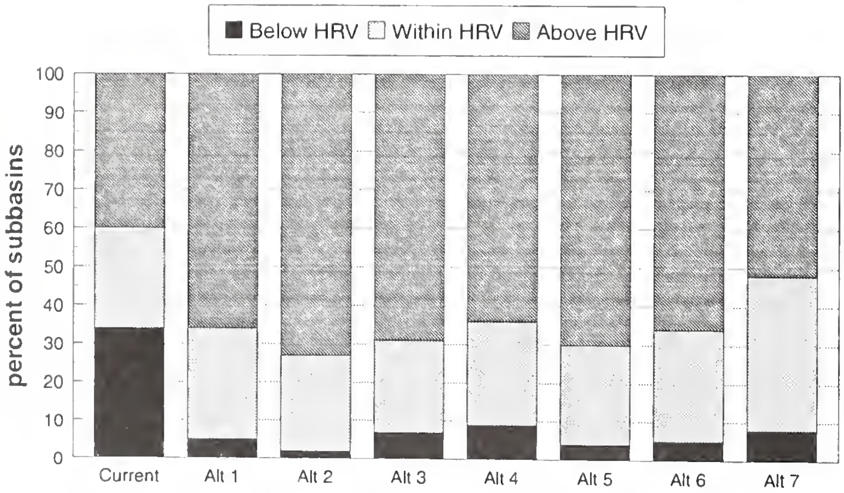


Figure 4-15. Upland Woodland, Above/Within/Below Historical Ranges in Variability, Project Area.

Table 4-34. Percent Change in Extent of Terrestrial Communities, UCRB Planning Area.

Terrestrial Community	Historical to Current	Alt 1 10 yr	Alt 1 100 yr	Alt 2 10 yr	Alt 2 100 yr	Alt 3 10 yr	Alt 3 100 yr	Alt 4 10 yr	Alt 4 100 yr	Alt 5 10 yr	Alt 5 100 yr	Alt 6 10 yr	Alt 6 100 yr	Alt 7 10 yr	Alt 7 100 yr
Exotics	N/A	+	++	+	++	-	- -	-	- -	NC	-	NC	-	NC	-
Upland Herbland	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Upland Shrubland	NC	NC	-	NC	-	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Upland Woodland	- -	+	+	+	+	+	+	+	+	+	+	+	+	+	+

This table shows the percent change in the extent of area of terrestrial communities from historical to current to future (10 years, 100 years). The data are for Forest Service- and BLM-administered lands in the UCRB planning area only.

++ = greater than 20 percent increase
\+ = up to 20 percent increase
NC = no significant change from current
\- = up to 20 percent decrease
-- = greater than 20 percent decrease

Source: Adapted from Quigley, Lee, and Arbelbide (1997).

Alternatives 5 and 6 than under Alternatives 3, 4, and 7.

The ineffectiveness of Alternative 7 relates to the lack of active weed control efforts in reserves and the several noxious weed species that are particularly invasive into dry grasslands (for example, yellow starthistle, spotted knapweed, and leafy spurge) that can spread even in the absence of disturbance. Improved grazing strategies or a no-grazing strategy would continue to restore dry grasslands, and these communities would either move toward being or would be dominated by large perennial bunchgrasses in most areas, but the invasion of noxious weeds and cheatgrass would be expected to occur at a higher rate than the improvement. Conifer encroachment would generally be reduced under Alternatives 3 through 7 as a result of a more liberal fire policy and the emphasis of prescribed burning, prescribed natural fires, and the basic reestablishment of fire regimes where possible. The exception to this would be the steep, rough inaccessible areas, especially in ERU 13, where conifer encroachment would be expected to continue.

Most crested wheatgrass seedings that were once essentially monocultures are projected to be more diverse, with various forbs and shrubs part of the seedings under Alternatives 4 and 6. Seedings under Alternatives 3, 5, and 7 would be expected to be more diverse than under Alternatives 1 and 2 as a result of interseeding and natural succession respectively. Overall, the dry grassland communities would be projected to not be within the desired range of future condition for the alternatives. However, Alternatives 3, 4, and possibly 7 would be expected to be the most successful in moving dry grasslands toward the desired range of future condition.

Dry Shrubland Potential Vegetation Group

The extent of the dry shrubland communities moving towards the desired range of future condition would continue to decrease in the planning area, although at a slower rate for Alternative 7 than under Alternatives 1 and 2, because of the continued invasion of noxious weeds and cheatgrass into these communities. Alternatives 3, 4, 6, and possibly 5 would be expected to reduce the spread of noxious weed infestations and therefore improve the extent of dry shrublands moving towards the desired range of future condition in the planning area. Livestock grazing pressure would improve under all these alternatives, but especially under Alternatives 3, 4, and 6.

Native large bunchgrasses with sagebrush overstory areas would not be common across the planning area under Alternatives 3 through 7, but would be much more apparent than under Alternatives 1 and 2, especially under Alternatives 3, 4, and 6. Livestock grazing pressure would be modified through emphasis on grazing systems that allow for soil and vegetative processes to function in a more natural state and the implementation of these systems under a more landscape approach. Litter accumulation, plant vigor, and soil protection would be enhanced under Alternatives 3 through 7, which would make a difference on the rate of improvement of the dry shrublands. Overall, Alternatives 3, 4, and 6 would be expected to improve the extent of dry shrublands moving towards the desired range of future condition.

Cool Shrubland Potential Vegetation Group

The extent of the cool shrubland communities moving towards the desired range of future condition would be expected to increase in the planning area under Alternatives 3, 4, and possibly 7. Alternatives 3, 4, and possibly 7 would be the most effective in increasing the extent of cool shrublands moving towards the desired range of future condition because they have the highest emphasis on noxious weed control, livestock grazing pressure improvement, and conifer control, in general. Alternatives 5 and 6 would be less effective in noxious weed control but would have a slower rate of decrease of cool shrublands than Alternatives 1 and 2.

Native large bunchgrasses with sagebrush overstory areas would be common across the planning area under Alternatives 3 through 7, especially under Alternatives 4 and 6 with the projected improvement in livestock grazing pressure. This would be due mainly to the emphasis on grazing systems that allow for soil and vegetative processes to function in a more natural state and implementation of those systems on a more landscape approach.

Litter accumulation, plant vigor, and soil protection would be enhanced under Alternatives 3 through 7, which would make a

difference on the rate of improvement of the cool shrublands. Reduction of woody species encroachment would be effective under Alternatives 3 through 7, especially under Alternatives 4, 6, and 7, because prescribed burning and prescribed natural fires are emphasized along with liberal wildfire policies in the reserves under Alternative 7. Harvesting of conifers in the highest density areas where fire is not practical would also increase in Alternatives 3, 4, and 6. This would be expected to increase vegetative diversity of these communities assuming that those areas with a noxious weed or cheatgrass understory were rehabilitated.

Effects on Major Factors Influencing Rangelands

Livestock Grazing

Improved livestock grazing strategies would reduce adverse affects of grazing to ecosystem processes and functions under all alternatives, especially in the dry shrublands and western juniper dominated areas. Grazing systems would be tailored to meet soil and vegetative processes and functional needs, especially undcr Alternatives 3, 4, and 6. Grazing pressure would be reduced under Alternatives 3, 4, and 6 because (1) the timing of livestock grazing in relation to critical times for plant health and the amount of residual vegetation after grazing would substantially improve conditions to allow soil and vegetative processes and functions to function properly, and (2) implementation of grazing systems under a more spatially- and functionally-integrated landscape approach would increase the amount of rangelands having grazing systems that allow for healthy ecosystem functions and processes.

Areas with vegetation types that respond according to the traditional climax model with regard to vegetation succession are predicted to improve in condition at a faster rate under Alternatives 3 through 7 than under Alternatives 1 and 2. The climax model asserts that reduction or elimination of livestock grazing pressure will permit improvement in rangeland vegetation through secondary succession (see Appendix F for more detail). The areas with vegetation types that more closely resemble the state and transition model (where succession of vegetation does not necessarily parallel changes in livestock pressure) are not predicted to improve much from improved grazing practices. These areas ~ most notably the Wyoming big sagebrush warm and salt desert shrub potential vegetation types ~ would continue to decline because of noxious weeds and cheatgrass invasions, but at a much slower rate under Alternatives 3 through 7 (especially 4 and 6) than Alternatives 1 and 2. In addition, improper grazing during drought periods and immediately thereafter would be discontinued across the planning area under Alternatives 3 through 7, which would allow those areas of relatively intact native plant communities to maintain plant vigor and competitiveness against noxious weeds and cheatgrass.

In Alternative 7, livestock grazing in the reserves would be limited to site-specific problem areas such as cheatgrass and noxious weed infestations for the purpose of furthering the intent of the reserves. There would be no grazing permits on the reserve in the sense of yearly permits. The effects on the noxious weed and cheatgrass areas as far as solving or reducing the problem would be generally slight to no measurable effect. The ability of livestock to effectively reduce noxious weeds or cheatgrass through consumption is appreciable, but site-specific, and generally risky in success rate because intensive management of livestock on extensive rangeland acreage is difficult to achieve.

Most noxious weeds are not highly palatable by livestock, and livestock consumption of cheatgrass is not heavy enough to substantially reduce the threat of fire. In good moisture years when cheatgrass production is very high and fire risk is high, the amount of livestock needed to reduce the cheatgrass amount would be extremely high. Even if there could be enough livestock brought in to effectively reduce the cheatgrass, remaining large, native bunchgrasses would be adversely affected since the grazing use would be partially during the critical growing season for these species. Natural re-establishment of large, native bunchgrasses would be inhibited by excessive livestock pressure during these periods.

Changes in Fire Regimes

An estimate of relative amounts of wildfire acres burned was made from outputs of the CRBSUM. Probabilities of wildfire vary with cover type and structural stages, and change according to the management prescriptions

within each alternative that affect vegetation composition and structure. The model estimates historical wildfire occurrence from a 400-year simulation, starting with historical stand conditions and using historical fire probabilities. The outputs for the seven EIS alternatives are average hectares per decade of disturbance, based on a 100-year simulation. Current levels are derived from Year 10 of the simulation. Model outputs were adjusted for the effects of mid-scale pattern and fine-scale live and dead vegetation and fuels composition and structure, as well as for overestimates in the modeled amount of management ignited prescribed fire (Hann et al. 1996, in Quigley, Lee, and Arbelbide 1996). Adjustment factors incorporate the concept of relative amounts of unburned area contained within wildfire perimeters that are caused by patterns of vegetation and fuel. The following discussion is based upon an estimate of historical acres burned, and trends in the relative amounts of acres burned per decade by wildfires for the next 100 years under each of the alternatives. The interpretation of the differences among alternatives and their comparison to historical disturbance may be adjusted before the Final EIS if additional refinement of the model is conducted, such as to account for possible overlap among treated areas.

Estimates of total acres burned by alternative and potential vegetation group were compared to historical burned acre estimates. Ratios of acres burned under the different alternatives to the historical period were obtained for the three rangeland potential vegetation groups ~ cool shrub, dry grass, and dry shrub ~ in which almost all of the burned acreage occurs (table 4-35).

For all three rangeland PVGs, all alternatives would result in fewer acres burned than historically. Burned acres would be reduced the most from historical in dry grass, and the least in dry shrub.

For all three PVGs, the least acreage of wildfire is expected to occur in Alternatives 3 through 6. For the cool shrub PVG, Alternative 4 would have the least amount of wildfire at 31 percent of historical, while Alternative 5 is the highest of this group with 48 percent of historical. In contrast, Alternatives 1 and 7 would have more wildfire than current levels. Alternative 7 would have the highest amount of wildfire, at 76 percent of historical levels of fire. Even if Alternative 7 may be the cause for the increased probabilities of fire, as well as a lesser emphasis on fire suppression in reserve areas. Alternative 1 would have about 127 percent and Alternative 2 about 153 percent of historical burned acreage. The model may assume less restoration of exotic grass ranges in Alternatives except 1 and 2, compared to other alternatives, causing a continuation of high levels of fire in annual grasslands. Alternative 2 may be higher than Alternative 1 if there is an assumed lack of fire suppression action within PACFISH buffers. Also, if these protected areas receive no grazing, it may be assumed that the increased amount of grass may also be a cause, possibly interacting with the other two factors just discussed, for the increase in fire probabilities over current levels. The reduced burned acreage predicted for Alternatives 3 through 6 could be caused by reductions in the amount of cheatgrass predicted by the model because of restoration efforts, and hence lower flammability.

Based strictly on estimates of the relative amounts of net wildfire, and taking into account planned levels of prescribed burning, there could be enough fire to reverse trends of increasing shrub density, loss of herbaceous stages, and encroachment of conifers in Alternatives 7 in the cool shrub PVG. If improved grazing management resulted in more residual herbaceous vegetation, it could be assumed that there would be much more wildfire then the model estimates, particularly in Alternatives 3, 4, and 6, for all PVGs. This could cause increased spread of exotic annual grasses in dry shrub and dry grass. However, in the cool shrub PVG, where exotic grasses are generally not a problem, increased wildfire would not bc detrimental if appropriate post-fire grazing management were applied.

Effects on Noxious Weeds, Exotics, and Introduced Forage Grasses

Noxious Weeds

Although cheatgrass is not legally declared a noxious weed in the project area, it is included in the following discussion when noxious weeds are mentioned.

Alternatives 5 through 7 would generally be more effective in preventing spread of noxious weeds than Alternatives 1 and 2. However, Alternatives 5 through 7 would not be as

Table 4-35. Ratio of Estimated Rangeland Net Acres Burned by Wildfire Each Decade to Estimated Historical Acres, UCRB Planning Area.

Potential Vegetation Group	Historical Acres	Current	Alternatives 1	2	3	4	5	6	7
			percent						
Cool Shrub	764,167	66	68	62	36	31	48	43	76
Dry Grass	721,872	30	30	21	13	12	17	14	59
Dry Shrub	893,801	98	127	153	61	53	80	67	97

This table applies to lands administered by either the Forest Service or the BLM in the UCRB planning area.

Source: Adapted from Quigley, Lee, and Arbelbide (1997).

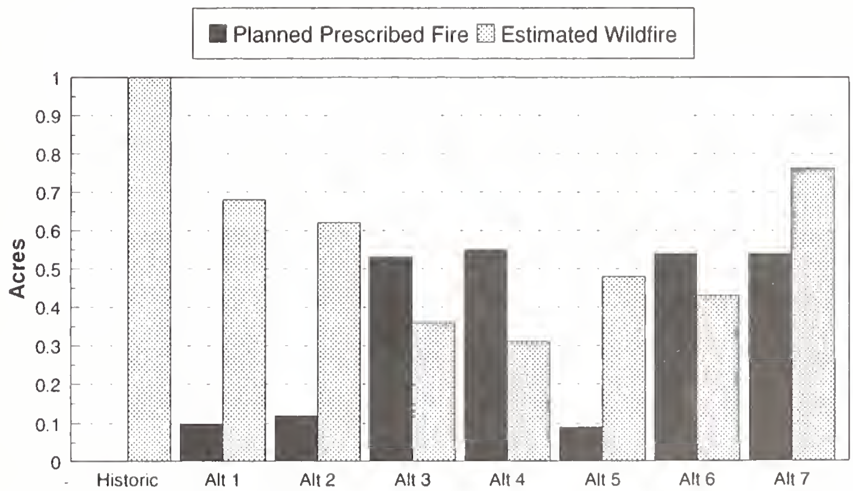


Figure 4-16. Cool Shrub Wildfire and Prescribed Fire, UCRB Planning Area.

Alternative 7 is still estimated to be only 59 percent of historical levels, likely because of effective fire suppression outside of reserves. Because very little prescribed fire is planned for the dry grass PVG, it is expected that the rate and amount of conifer encroachment would continue at present levels, or potentially increase, with the least amount of increase in Alternative 7.

Much more fire is simulated for the dry shrub PVG than for cool shrub and dry grass. Estimated levels of wildfire would range from 53 to 80 percent of historical in Alternatives 3 through 6. Alternative 7 would have 97 percent of net historical burned acreage. The lower level of restoration of cheatgrass ranges in prescribed fire were implemented at planned levels (figure 4-16), herbaceous-dominated stages would not be likely to achieve the levels in which they historically occurred in cool shrub in Alternatives 1 through 5, because there would not be enough fire disturbance to reverse current trends. Only Alternative 7 would have more disturbance by fire (wildfire and prescribed fire) than is estimated to have occurred from historical wildfire.

For the dry grass PVG, the model must assume extremely effective fire suppression, because Alternatives 2 through 6 only have 12 to 30 percent of historical levels of burned acres. While there would be little wildfire suppression within reserve areas, the amount of wildfire in

effective, overall, as Alternatives 3 and 4, which would be especially effective in substantially reducing the rate of spread of noxious weeds in range clusters 5 and 6, where the majority of rangelands exist. Rangelands near roads and agricultural and urban areas would still be priority areas for noxious weed control efforts. This is especially true in dry shrubland types in range clusters 5 and 6 (see maps in Chapter 2) where dominant native rangeland vegetation generally exists in the more moist areas away from roads, agriculture, urban areas, and watering areas for livestock. Altered sagebrush steppe areas, in range clusters 5 and 6, would be expected to be invaded by noxious weeds such as medusahead and yellow starthistle, especially in eastern Oregon and southwestern Idaho. However, control efforts under Alternatives 3 and 4 would be expected to be relatively effective in reducing the spread of noxious weeds in these clusters.

The various knapweeds and leafy spurge would be expected to be a problem in the more moist areas, especially the dry grasslands and cool shrublands in eastern and southeastern Idaho and western Montana. Chemical control of some noxious weeds such as leafy spurge or the various knapweeds requires repeat treatment for years to be effective in controlling existing infestations. It is anticipated that treatment of the same noxious weed areas year after year would be the norm due to the difficulty in killing some weeds. However, control efforts to reduce the spread of these weeds, especially by seed, would be expected to be effective. Large infestations of these species would probably remain a problem but would not be expected to increase in size under Alternatives 3 and 4, especially in range clusters 5 and 6.

The reserve areas, in general, are unroaded and away from urban and agricultural areas, so they are not expected to be heavily infested with noxious weeds. In addition, the lack of disturbance in the reserve areas should help in limiting some noxious weeds that require disturbance to become established. However, it is expected that some noxious weeds, such as leafy spurge and the various knapweeds, would still be able to invade and spread within reserve areas because they can spread even in the absence of disturbance.

A much more effective control effort is expected under an Integrated Weed Management strategy in Alternatives 3 through 7 than the existing programs under Alternatives 1 and 2. This approach puts emphasis on all lands, not just Federally administered lands, and with a more effective educational program great strides would be expected in noxious weed control. The educational programs are expected to substantially reduce the human-caused spread of noxious weeds. Continued spread of noxious weeds by wildlife, water, wind, and fire would occur, but intensive control efforts in range clusters 5 and 6, especially under Alternatives 3 and 4, would reduce the spread of noxious weeds through reductions in seed source and fire prevention. In general, rangeland productivity and biodiversity would be seriously affected by the expected increase in noxious weeds under Alternatives 1, 2, and 5, and would be expected to affect livestock operations, wildlife, and soil and native vegetative health especially in range clusters 1, 2, 3, and 4.

Although noxious weed control efforts under Alternatives 3 and 4 would be expected to reduce the spread of noxious weeds in range clusters 5 and 6, the effort needed to implement these alternatives requires substantial increases in the number of acres of treatment than is occurring under current emphasis levels and normal base funding levels. In addition, an IWM strategy that incorporates all entities (city, county, State, tribal, and Federal) under one strategy, with effective educational efforts focusing on inventory of and prevention of noxious weeds, would be required along with acreage treatments for the expected results under Alternatives 3 and 4 to occur. Acreage treatments of altered sagebrush steppe does not include fire rehabilitation, which is not part of normal base funding levels for Forest Service and BLM administrative units. Fire rehabilitation of altered sagebrush steppe or other weed areas would be considered above and beyond the expected acres treated under noxious weed programs.

Table 4-36 ranks the alternatives according to their effectiveness in noxious weed control by the three major rangeland PVGs for the UCRB. The ranking is based on a relative index of 0 to 30, with 0 being the least effective and 30 being the most effective. Overall, Alternatives 3 through 7 would be the most effective alternatives, with Alternatives 1 and 2 the least effective. Alternative 4 was the most effective, followed closely by Alternative 3. Alternative 7

was similar to but slightly more effective than Alternative 6. Alternative 5 was the least effective of the action alternatives but still much more effective than Alternatives 1 and 2. Effectiveness of noxious weed control was heavily dependent on the emphasis of the alternative within each range cluster. The emphasis of an alternative is defined by the steps of IWM that would be taken, the rangeland plant communities and noxious weeds to which the steps would be targeted, and the acreage of weed control that would be treated. For example, noxious weed control in Alternative 4 would be more effective in cool shrublands in clusters 2 and 3 than in dry grasslands in those same clusters. This is a result of the amount of acres treated consistent with table 3-7 and the objectives and standards in Chapter 3, and the fact that noxious weeds are not as big a problem in the cool shrublands as they are on dry grasslands. In the UCRB, the most effective noxious weed control efforts would occur in range clusters 5 and 6, especially under Alternatives 3 and 4 for dry grasslands and cool shrublands, and range clusters 2 and 3 for dry shrublands.

Table 4-37 displays a relative comparison of alternatives within the UCRB by the three major rangeland PVGs in relation to how effective each alternative would be in moving the trend of the PVG away from a noxious weed infested community and toward the desired range of future condition. The trend is displayed using a relative range of -4 to +2, with -4 being the fastest movement away from the desired range of future condition and toward a noxious weed infested community and +2 being the fastest trend away from a noxious weed infested community and toward the desired range of future condition. Overall, Alternative 4 and then 3 would be most effective in reducing the spread of noxious weeds into the three PVGs and moving them toward the desired range of future condition. Alternatives 1 and 2 would be the worst, with Alternatives 6, 7, and 5 respectively, better than Alternatives 1 and 2. If the overall trend for a PVG under an alternative was projected to be downward, this does not necessarily mean that trends for each cluster were projected to be downward. For example, even though the overall trend for dry grassland across all alternatives showed to be away from desired range of future condition, the trend in Alternative 4 for dry grassland in Range Clusters 5 and 6 was projected to be very high towards desired range of future condition.

Tables 4-38, 4-39, and 4-40 display the major noxious weeds that would invade dry grassland, dry shrubland, and cool shrubland PVGs under Alternatives 1 through 7 and explain the effectiveness of the alternatives. The amount of acres treated by these alternatives were based on current (Alternatives 1 and 2) to inflated (Alternatives 3 and 4) projected budget levels which provides a range for analysis. The acres treated were a result of the implementation of the management activities as described in Chapter 3 for all alternatives.

Table 4-36. Relative Ranking of Alternatives in Preventing Further Noxious Weed Infestations, UCRB Planning Area.

	Alternatives						
Potential Vegetation Group	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Dry Grassland	0	0	15	15	3	11	13
Dry Shrubland	15	15	25	28	19	22	16
Cool Shrubland	8	8	21	21	15	13	20

This table applies to the UCRB planning area.

0 = least effective
30 = most effective

Source: Adapted from Chapter 3 Tables 3-6 and 3-7.

Table 4-37. Relative Trend of Rangeland Vegetation Toward or Away from Desired Conditions, UCRB Planning Area.

	Alternatives						
Potential Vegetation Group	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Dry Grassland	-4	-4	-2	-2	-4	-2	-2
Dry Shrubland	-2	-2	+1	+2	-1	+1	-1
Cool Shrubland	-3	-3	+1	+1	-2	-2	-1

This table applies to the UCRB planning area.

-4 = fastest movement away from DRFC and toward noxious weed infestation
+2 = fastest trend away from noxious weed infestation and toward DRFC

Source: Adapted from Quigley, Lee, and Arbelbide 1997.

Table 4-38. Noxious Weeds Infesting Dry Grasslands, UCRB Planning Area.

Primary Exotic Species Causing Infestation	Primary Location of Infestations (Range Clusters and General)	Discussion of Cause and Effects
Yellow Starthistle	2,3,5,6, Western Idaho	**Alternatives 1, 2, and 5.** No IWM or any other strategy that is Idaho coordinated among private, city, county, State, and Federal entities, is being used to control weeds in Alternatives 1 and 2. Efforts are ineffective in preventing the spread of noxious weeds because of the low amount of acres treated under these alternatives. Existing and new infestations continue to spread across the dry grasslands especially near major roads, waterways, urban, agricultural, and livestock waters initially and then elsewhere as time goes on. The bottom line is that the dry grassland PVG would decline over the 100-year period as a result of ineffective noxious weed control.
Dyers Woad	6, Southeastern Idaho	
Leafy Spurge	2,3,5,6, Eastern Idaho and Western Montana	
Spotted Knapweed	2,3,5, Eastern Idaho and Western Montana	
Rush Skelton Weed	5,6, Western Idaho	
Cheatgrass and Medusahead	5,6, Southern and SW Idaho	
Sulfur Cinquefoil	3, Western Montana	
Common Crupina	3, Central Idaho	
Orange and Yellow Hawkweeds	3, Western Montana	

Table 4-38. Noxious Weeds Infesting Dry Grasslands, UCRB Planning Area. (continued)

Primary Exotic Species Causing Infestation	Primary Location of Infestations (Range Clusters and General)	Discussion of Cause and Effects
Same	Same	**Alternatives 3, 4, 6, and 7.** An effective IWM strategy has unified all private, city, county, State, and Federal entities under all these action alternatives. The amount of acres treated, which differs by alternative, does not include the treatment of many acres of these noxious weeds in range clusters 2 and 3. These weeds would be expected to increase in the dry grassland PVG in range clusters 2 and 3, under all alternatives. Control efforts are focused on cheatgrass, yellow starthistle, and leafy spurge onthe highly susceptible sites with the rest of the weeds of second priority under all alternatives. The amount of acres of noxious weed control in range clusters 5 and 6 would be expected to be adequate to reduce the current spread of noxious weeds and increase the acreage of dry grassland PVG in range cluster 5 and 6 under Alternatives 3, 4, and 7 and in range cluster 6 under Alternative 6. The bottom line is that the dry grassland PVG would be expected to decline in range clusters 2 and 3 under all alternatives and increase in range clusters 5 and 6 under Alternatives 3, 4, and 7. All of these alternatives would be more effective than Alternatives 1 and 2.

This table lists noxious weeds that are infesting dry grasslands on Forest Service- and BLM-administered lands and where those weeds are the most extensive in the UCRB planning area. Causes and effects of implementing the Integrated Weed Management strategy described in Tables 3-5 and 3-7 are also discussed.

Abbreviations used in this table:
IWM = Integrated Weed Management
PVG = potential vegetation group

Source: Adapted from Quigley, Lee, and Arbelbide 1997.

Table 4-39. Noxious Weeds Infesting Dry Shrublands, UCRB Planning Area.

Primary Exotic Species Causing Infestation	Primary Location of Infestations (Range Clusters and General)	Discussion of Cause and Effects
Yellow Starthistle Halogeton Diffuse Knapweed Rush Skeleton Weed Cheatgrass and Medusahead Dyers Woad	5,6, Western Idaho 5,6, South-central Idaho 6, South-central Idaho 5,6, Western and Southwestern Idaho 5,6, Western and Southwestern Idaho 6, Southeastern Idaho	**Alternatives 1 and 2.** No IWM or any other strategy that is coordinated among private, city, county, State, and Federal entities, is being used to control weeds in Alternatives 1 and 2. Efforts are ineffective except in range clusters 2 and 3, where dry shrubland occupies little acreage and where weed problems in dry shrubland are relatively minor and spread is predicted to be prevented with current weed control strategies. Existing and new infestations continue to spread across the dry shrublands especially near major roads, waterways, urban, agricultural, and livestock waters initially and then elsewhere as time goes on. The bottom line is that dry shrublands would decline in range clusters 5 and 6 over the 100-year period as a result of ineffective noxious weed control. In addition, noxious weeds are invading altered sagebrush steppe which provides a disturbed site for noxious weed establishment, especially medusahead. Ineffective efforts to reduce and prevent the spread of altered sagebrush steppe would allow for more dry shrubland areas to be susceptible to noxious weeds.
Same as above	Same as above	**Alternatives 3, 4, 5, 6, and 7.** An effective IWM strategy has unified all private, city, county, State, and Federal entities under all these action alternatives. Control efforts are focused on Dyers woad and cheatgrass on the highly susceptible sites, with the rest of the weeds of secondary priority under all alternatives. Noxious weeds would be expected to increase in the dry shrublands in range cluster 6 under all alternatives, but to varying degrees. Noxious weed spread would be prevented, and some recovery of dry shrublands would occur, in range clusters 2 and 3 under all of these alternatives except for range cluster 2 in

Table 4-39. Noxious Weeds Infesting Dry Shrublands, UCRB Planning Area. (continued)

Primary Exotic Species Causing Infestation	Primary Location of Infestations (Range Clusters and General)	Discussion of Cause and Effects
		Alternative 7. Noxious weed spread would be prevented, with some recovery of dry shrublands, in range cluster 5 in Alternatives 3 and 4, but noxious weed spread would continue in Alternatives 5, 6, and 7. The bottom line is that the dry shrubland PVG would be expected to decline in range cluster 6 under all alternatives and increase in range clusters 2, 3, and 5 under Alternative 4, with the other alternatives having varying success within these range clusters. All of these alternatives would be more effective than Alternatives 1 and 2.

This table lists noxious weeds that are infesting dry shrublands on Forest Service- and BLM-administered lands and where those weeds are the most extensive in the UCRB planning area. Causes and effects of implementing the Integrated Weed Management strategy described in Tables 3-5 and 3-7 are also discussed.

Abbreviations used in this table:
IWM = Integrated Weed Management
PVG = potential vegetation group

Source: Adapted from Quigley, Lee, and Arbelbide 1997.

Altered Sagebrush Steppe

The noxious weed discussion in this chapter provides a more in-depth look at the effects of the alternatives on the control of cheatgrass and medusahead. Cheatgrass and medusahead form the vast majority of the altered sagebrush steppe vegetation.

Altered sagebrush steppe would continue to slowly increase in the dry shrubland areas, in general, under Alternatives 1, 2, 5, and 7. Alternatives 3, 4, and 6 would be more effective in preventing the spread of altered sagebrush steppe than Alternatives 7 and 5, with Alternatives 1 and 2 the least effective.

The more moist areas of the dry shrublands away from roads, agriculture, urban areas, and livestock waters would generally be the native-dominated dry shrubland communities.

Greenstripping, restoration efforts, and fire suppression activities are projected to be most effective for prevention of further spread of cheatgrass and/or medusahead and rehabilitation of altered sagebrush steppe, under Alternatives 3 and 4. The lack of a major effort to restore altered sagebrush steppe and to prevent the frequent fire occurrence (which further spreads the infestations) would be expected to allow for more spread of altered sagebrush steppe in Alternatives 5 and 7, and especially Alternatives 1 and 2. Adding more urgency to the altered sagebrush steppe problems is the invasion and the out-competing of the cheatgrass areas by medusahead, yellow starthistle, and other noxious weeds of no forage value for wildlife or livestock. Inadequate control efforts under Alternatives 1,. 2, 5, and 7 would preclude controlling the spread of altered sagebrush steppe.

Table 4-40. Noxious Weeds Infesting Cool Shrublands, UCRB Planning Area.

Primary Exotic Species Causing Infestation	Primary Location of Infestations (Range Clusters and General)	Discussion of Cause and Effects
Spotted Knapweed Leafy Spurge Diffuse Knapweed Rush Skeleton Weed Cheatgrass and Medusahead Dyers Woad	2,3,5,6, W. Montana, Central, Northern, and SE Idaho 2,3,5,6, E. Idaho 6, S. Central Idaho 5,6, SW Idaho 5,6, Western Idaho 6, SE Idaho	**Alternatives 1 and 2.** No IWM or any other strategy that is coordinated among private, city, county, State, and Federal entities, is being used to control weeds in Alts. 1 and 2. Efforts are ineffective in preventing the spread of weeds. Existing and new infestations continue to spread across the cool shrublands especially near major roads, waterways, urban, agricultural, and livestock waters initially and then elsewhere as time goes on. The bottom line is that the cool shrubland PVG would decline over the 100-year period as a result of ineffective noxious weed control.
Same	Same	An effective IWM strategy has unified all private, city, county, State, and Federal entities under all the action alternatives (3 through 7). Control efforts are focused on Dyers woad and cheatgrass (especially in western Idaho on cool shrublands with western juniper) on the highly susceptible sites, with the rest of the noxious weeds of secondary priority under all alternatives. The number of acres of cool shrublands infested with noxious weeds is generally less than what is infested on the dry grassland and dry shrubland PVGs. The bottom line is twofold: (1) prevention of spread of noxious weeds and increase in acreage in cool shrublands would be expected in range cluster 5 in Alternatives 3, 4, and 7, and in range cluster 6 in Alternative 4; (2) in general, the acres of cool shrublands would be expected to decrease in range clusters 2 and 3. All of these alternatives would be more effective than Alternatives 1 and 2.

This table lists noxious weeds that are infesting dry shrublands on Forest Service- and BLM-administered lands and where those weeds are the most extensive in the UCRB planning area. Causes and effects of implementing the Integrated Weed Management strategy described in Tables 3-5 and 3-7 are also discussed.

Abbreviations used in this table:
IWM = Integrated Weed Management
PVG = potential vegetation group

Source: Adpated from Quigley, Lee, and Arbelbide 1997.

Improper livestock grazing pressure during times of drought would be reduced under Alternatives 3 through 7, and this would slow down the spread of altered sagebrush steppe because the competitiveness of the native large bunchgrasses would be more effective against altered sagebrush steppe.

Most of the proposed reserves would not have large acreage of altered sagebrush steppe. However, Alternative 7 would not be entirely effective in preventing spread of cheatgrass and medusahead and altered sagebrush steppe because of the lack of active weed control, the lack of fire suppression, and the proximity of altered sagebrush steppe in matrix areas. With fire rehabilitation efforts, which are over and above BLM and Forest Service budgetary expenses on weed control, altered sagebrush steppe would bc expected to decline even further in Alternatives 3 and 4, and possibly in Alternative 6.

Introduced Forage Grasses

The amount of introduced forage grasses would decrease under Alternatives 3 through 7, because fire rehabilitation efforts in dry shrubland types would be expected to emphasize native species instead of crested wheatgrass or other perennial introduced forage species, and because interseeding existing seedings with native species would be pursued to one degree or another (actively in Alternatives 4 and 6, with less emphasis in Alternatives 3 and 5, inconsistent emphasis in Alternatives 1 and 2, and no emphasis in Alternative 7 reserves). Under Alternatives 3 through 6 and outside of reserves in Alternative 7, fire rehabilitation efforts would be either handled by resting and protection until recovery of key native species is complete, or if natural rehabilitation would not meet objectives within a reasonable timeframe, then the area would be seeded with a diverse mix of perennial species with natives being heavily emphasized. It is expected that some areas, most notably in the dry shrublands, would still need to be seeded with perennial introduced forage species in order to achieve some resemblance of vegetation structure and maintain forage production on these sites. Most existing seedings would be expected to be more diverse with interseedings of shrubs, forbs, and some grasses. The exceptions would be those dry shrubland seedings where limited success would be expected with seeding natives. The net effect would be that most of the introduced forage grasses seedings that were essentially monocultures would have been diversified under Alternatives 4 and 6. Alternatives 3 and 5 would still have a substantial amount of old seedings that had not been interseeded, but the new seedings as a result of rehabilitation efforts would be diverse and mostly native species.

Natural revegetation would be emphasized in reserves under Alternative 7. As such, many of the drier seedings such as crested wheatgrass in the dry shrubland areas would not be very diverse, because the crested wheatgrass would be able to out-compete native species trying to become reestablished in the seedings. Some sagebrush encroachment back into the seedings would occur throughout the seedings in the dry shrublands and cool shrublands. Under Alternative 7, the bulk of the natural reestablishment of natives in seedings would occur in the cool shrublands and in the more moist areas of the dry shrublands. However, it is not expected that reserve areas would have much seeded range, since part of the intent of the reserves is to protect native vegetation communities. Active rehabilitation of recent or old disturbed areas such as wildfire areas, would be limited in reserves; therefore, opportunities would be apparent for noxious weeds to establish and spread to the detriment of native species. The potential increased frequency of wildfire in reserve areas would not have much of an effect on most of the seedings, because crested wheatgrass seedings do not burn as readily as natives or exotics and provide somewhat of a fire break (since the amount of fine dry fuels for burning is lacking in these seedings). Overall, the extent of introduced forage grasses in seedings would decline under Alternative 7, but at a slower rate than Alternatives 3, 4, and 6.

Effects on Climate and Disturbance Stresses

Livestock grazing pressure would be changed under Alternatives 3 through 7 to allow for better grazing practices on those areas that are in the 12-inches-and-below precipitation areas. Priority would be established on these areas, most notably the dry shrubland areas, to ensure that grazing pressure is such that soil and vegetative function and process needs are being met on a yearly basis, especially during

and after drought years. As a result, the dry shrublands would not be made more susceptible to noxious weed invasion and would be less likely to convert to altered sagebrush steppe by the grazing pressure disturbance. Alternatives 1 and 2 do not have provisions to protect rangelands from improper grazing pressure during and after drought years. Alternatives 7, 4, 6, and 3 (in that order) would be the most effective in reducing drought-related impacts from livestock grazing pressure. Alternative 5 would be less effective, with Alternative 1 and 2 the least effective. The improvement in grazing pressure through changes in grazing would not be a factor in the reserve areas, because permitted grazing on an annual basis would not be allowed under Alternative 7. Limited grazing would allow the dry shrubland natives to become vigorous and to better compete against exotics under Alternative 7.

Effects on Other Factors Affecting Rangeland Health

Woody Species Encroachment and Density

The implementation of management activities, such as prescribed burning and bole harvest with slash dispersal on sites under Alternatives 3 through 7 are projected to be effective in woody species control and in providing for increased diversity and productivity of understory native vegetation, in general. The exception may be the encroachment of conifers in ERU 13, where steep, rough areas of limited access would preclude most active methods of woody species control. Otherwise, most of the problem areas with woody species would be expected to be effectively controlled under Alternatives 3, 4, 6, and 7 and slightly less so under Alternative 5. The woody species encroachment problem would still occur under Alternatives 1 and 2. The improved fire program with more liberal prescribed burning and prescribed natural fires, along with more fine fuels being available for wildfire, would effectively reduce the woody species encroachment problem under Alternatives 3 through 7.

Density problems would still exist in some areas with junipers and other conifers, but the harvesting of these woody species would have increased substantially enough to take care of most of the density problems where fuels are not available in large enough amounts to allow fire control of woody species. Woody species encroachment is projected to probably be effectively controlled under Alternative 7. The passive approach to management, with the buildup of fine fuels and the increase in wildfires and prescribed burns, would probably eliminate most of the encroachment problems. Density problems would still be more apparent than in Alternatives 3 through 6 but would be less of a problem than in Alternatives 1 and 2. The increased fuels in Alternative 7 would allow wildfire and prescribed fire to move into the perimeters of the dense woody species areas and effectively reduce the size of some of these areas. In addition, limited active approaches (such as harvesting of the more dense areas) would be allowed in this alternative; combined with fire, this would reduce the amount of dense woody areas in comparison with Alternatives 1 and 2.

Microbiotic Crusts

Microbiotic crust cover would probably improve on all rangelands under Alternatives 3 through 7, except for Alternative 5. Because of the improved grazing strategies and the restoration of some native communities, most rangelands would provide a favorable environment for enhancing the development of microbiotic crust cover. Alternatives 4 and 6 would probably be the most effective, with Alternatives 7, 3, and 5 next, and with Alternatives 1 and 2 the least effective. The increase of noxious weeds, especially altered sagebrush steppe, along with the increased fire occurrence in the altered sagebrush steppe under Alternative 5 would be expected to cause a continued decline in microbiotic crusts on dry shrublands. Having no grazing on reserves would be beneficial to microbiotic crusts under Alternative 7, in general; however, the lack of control of noxious weeds especially altered sagebrush steppe, could occupy a majority of the dry shrublands. Fortunately, most of the reserve areas would not be expected to have a serious noxious weed problem because of their distance from roads and urban and agricultural areas.

Livestock-Big Game Interactions

Livestock/big game conflicts would probably be effectively reduced under Alternatives 3, 4, 6, and 7. The rate of reduction of conflicts under Alternatives 3 through 7 would be expected to

be greater than under Alternatives 1 and 2. Alternatives 4 and 6 would be expected to have the highest reduction in conflicts, with Alternatives 7 and 3 next, in that order. Alternatives 5, 1, and 2 would be expected to be the least effective. Alternative 5 within livestock production areas may actually increase conflicts in some areas, where emphasis toward livestock production would be expected to reduce the shrub component of deer and antelope winter range and possibly cause livestock/big game conflicts. All results would depend on the invasion of exotics onto important big game ranges. If exotics were to eliminate important areas such as winter ranges, then the livestock/big game conflicts on those and other ranges may increase.

Grazing in Forested Settings

The SIT did not specifically evaluate livestock grazing effects in forest ecosystems for any of the alternatives. Some forested terrestrial communities have open, park-like structures and support stands of grasses and forbs desirable to livestock (for example, ponderosa pine forests in the dry forest PVG). Other forested terrestrial communities provide livestock forage for a limited time following timber harvest through increased production of herbaceous and woody growth. Thinning and burning may have similar effects but are not equally effective in all forested communities (Stoddart et al. 1975).

Grazing effects of the alternatives in forest ecosystems depend on complex interactions between livestock, forest distribution, and forest management practices such as harvest, thinning, and prescribed fire. Livestock grazing can have positive and negative effects on forest communities, depending on livestock numbers, distribution, and season of use. Grazing can reduce fuel loadings and alter fire regimes, improve tree seedling germination through seed trampling and reduction of heavy litter, reduce competition of herbaceous plants with tree seedlings, facilitate the spread of white pine blister rust through the spread of alternate hosts (for example, *Ribes* spp.) by grazing animals, increase availability of soil moisture, and/or induce direct injury to tree seedlings (Doescher and Karl 1990; Stoddart et al. 1975).

Without detailed SIT evaluation, the effects of livestock grazing on forested communities are assumed to be similar to those discussed for rangeland communities: improved livestock strategies are cxpected to reduce adverse effects of grazing on forested ecosystem processes and functions under all alternatives. Grazing systems would be tailored to meet soil and vegetative processes and functional needs, especially under Alternatives 3, 4, and 6. Grazing pressure is expected to be reduced under Alternatives 3, 4, and 6. For forested communities where grazing is shown to have impacts on successional transitions, vegetation is predicted to improve in condition at a faster rate under Alternatives 3 through 7 than under Alternatives 1 and 2. Improper grazing during drought periods and immediately thereafter would be discontinued across the planning area under Alternatives 3 through 7, which would allow dry forest communities with relatively intact native understories to maintain plant vigor and competitiveness against noxious weed invasion.

Terrestrial Species

Assumptions

The following major assumptions were made by the Terrestrial Vertebrate Panels during their evaluation of alternatives:

- Activities planned for the next 10 years will result in trends toward the desired future condition. This is especially important for roads under alternatives that call for both accelerated management activity and a reduction in road density.

- Snag standards developed in this EIS, as well as those that will be developed from

Summary of Key Effects and Conclusions

- Currently there are 51 species in the UCRB planning area with unfavorable habitat outcomes (Outcome Class 4 or 5). Implementation of Alternatives 4, 6, and 7 would result in 32, 32, and 33 species with unfavorable habitat outcomes; and Alternatives 5, 3, 2, and 1 would result in 37, 38, 39, and 46 species with unfavorable outcomes.
- On average, Alternatives 4, 6, and 7 would provide the highest likelihood of species persistence and viability over the next 100 years. These alternatives emphasize restoration of habitats, which would likely reverse negative trends for most species because of improved management, riparian emphasis, and proposed activities that have varying degrees of positive effects on some habitats and species.
- Alternative 1 would result in the highest number of species with increased risk of extirpation or loss of viability because it lacks the increased emphasis on restoration of forest, rangeland, and riparian habitats of the other alternatives.
- Alternatives 4 and 6 would result in more species with improved likelihood of persistence and viability than with increased risks of extirpation, due to improved habitat condition through restoration of uplands and riparian emphasis.
- Alternatives 3 and 7 would result in an equal number of species with increased risks of extirpation and improved likelihood of persistence and viability, due in part to the intermediate levels of restoration in upland and riparian communities.
- Alternatives 1, 2, and 5 would result in more species with increased risk of extirpation than with improved likelihood of persistence and viability. Activity levels expected under these alternatives would result in higher levels of habitat modification, which is assumed to result in some risk to species.
- Human access and its direct and indirect effects on wildlife species are most appropriately addressed at finer scales. However, in relative terms, Alternatives 6 and 7 would result in lower levels of human activity and therefore lower impact levels. Alternatives 1 and 5 are predicted to have the highest levels of human activity and therefore the highest level of impacts to wildlife from access and related activities. Alternatives 2, 3, and 4 would result in intermediate levels of impacts associated with access.
- Grizzly bear and Columbian sharp-tailed grouse have undergone the greatest change in habitat conditions, based on a comparison of current and historical conditions. Both species were widely distributed historically, but currently their habitats and populations are reduced, isolated, and disjunct. Alternative 7 is the only alternative predicted to improve conditions for grizzly bear, due to the habitat conditions that large reserves would provide. Non-Federal lands will continue to limit populations of these species.
- Implementation of any alternative except Alternative 1 would result in improved chances of persistence and viability for some species ("increasers") (table 4-42).
- Implementation of any alternative would result in some risk of extirpation for some species because of cumulative effects on all lands ("decreasers") (table 4-43).
- Under Alternatives 1 and 5, if a species were trending toward extirpation based on the changes from historical to current conditions, that trend would be continued. In comparison, under Alternatives 4 and 6, predicted negative trends in habitat would tend to be stopped or slowed down.
- There would be little change in overall outcomes for the majority of species analyzed under any alternative. This result is based on current and projected future populations and habitat conditions, and on the fact that most species respond to habitat changes at finer scales than this evaluation portrays.
- None of the alternatives approach historical conditions (habitats or population) for the 118 vertebrate and 14 plant species analyzed. Loss of habitat both on and off Federal land contributes to this condition.
- Threatened and endangered plants have a risk of extirpation or viability loss, primarily due to reduced habitat conditions and availability and to limited population sizes compared to historical conditions. The alternatives would not change this condition because many of the species are local endemics with little chance to expand habitat or populations and are difficult to analyze at this scale. However, protection will be provided for these species under provisions in the Endangered Species Act and recovery and conservation plans.
- Habitats of threatened and endangered wildlife species do not demonstrate a substantial change in any alternative at the broad scale of analysis. The one exception is the bald eagle, which shows an improved likelihood of persistence and viability under Alternatives 4 and 6 due to riparian emphasis.
- Major exceptions to this list of summary findings are those for woodland birds. Alternatives 4 and 6 would result in the least favorable outcomes for woodland birds, because of proposed reductions in extent of juniper woodlands (in which the reduced extent would more closely approximate the historical range of variability).

finer-scale analyses, will address snag number, diameter, height, decay class, species, distribution, and replacement through time. Standards will be patterned from historical conditions for vegetation communities, but will include consideration of species habitat requirements and current conditions (that is, landscapes that are currently deficient in snags or contain abundant snags). Standards will clearly specify how snags are to be treated under all types of prescriptions (such as harvest, thinning, salvage, prescribed fire).

- ◆ Downed wood standards will address number and size (diameter and length) of pieces, species, distribution, and replacement through time. Standards will be patterned from historical conditions by vegetation communities, but will include consideration of habitat requirements and current conditions (that is, number of landscapes that are currently deficient in logs or that currently contain abundant logs). Standards will clearly specify how logs are to be treated under all types of prescriptions (such as harvest, thinning, salvage, prescribed fire).

- ◆ Consideration of animal species will be a key component of the ecosystem analysis used to implement the selected alternative. Species' habitat requirements will be used to help shape specific prescriptions and the scheduling and location of activities. Such considerations will be part of all prescriptions, including those designed to accomplish restoration objectives. Actions that could reduce habitats that are currently scarce or poorly distributed will be carefully analyzed to ensure that they will still allow species habitat requirements to be met. Analysis of how specific habitats change through time will be a component of ecosystem analysis.

- ◆ Vegetation patterning will be a key objective of restoration activities. Historical patterns of vegetation fragmentation and juxtaposition will be used to establish stand and landscape objectives for restored vegetation. Such consideration is particularly important where historical forest conditions included a fine-scale mix of different forest seral stages and tree densities, including small openings.

- ◆ Restoration activities will be directed at all vegetation types, with priorities based on ecosystem analysis and finer-scale planning processes. Specific restoration activities would include aspen regeneration, cottonwood and willow regeneration and planting, and regeneration of all shrub species that were historically associated with upland and riparian shrub types. Juniper woodlands will persist in amounts and distributions so as not to create a problem for species associated with this vegetation community.

- ◆ Restoration activities that are well studied and well understood will be pursued as aggressively under Alternative 6 as they are under Alternative 4 in the long term.

- ◆ Plant conservation strategies that have been approved will be implemented.

- ◆ Caves, cliffs, mines, and other bat roost sites and hibernacula will be protected in all alternatives.

Limitations

The following cautions or limitations in interpreting the scientific analysis were identified by the Science and EIS teams:

- ◆ *Broad geographic scale and time scale* ~ Habitat projections represent summarized conditions within species' ranges within each of the EIS areas. This means that for some species, it is likely that conditions within some smaller areas will be much better than the average and in others they will be much worse. Also, the landscape staff of the SIT assessed vegetation conditions for three time periods only: 10 years, 50 years, and 100 years; vegetation conditions were not assessed in the intermediate time periods. It is possible that conditions at intermediate times could be worse or better.

- ◆ *Resolution of the data and planning guidance* ~ Habitat data reviewed for the assessment were broad in scope and represent only the macrohabitats with which species are associated. Habitats that are distributed at finer scales, such as riparian habitats and within-stand

microhabitat features (such as snags and logs), were not well represented by the data. Consequently, it was difficult to assess outcomes for species that require more specific habitat features. In many cases the objectives and standards in Chapter 3 of the EIS also do not contain enough detailed information on how management actions and habitats would be distributed across the landscape.

- *Ability to infer population results from habitat analysis* ~ The ability to infer population consequences from habitat assessments is a difficult task. This is especially true for species whose populations are small and/or poorly distributed across the landscape. The lack of specific data on population size, structure, and functional and numerical response means that inferences must be made from changes in habitat abundance and gross distribution patterns. The results may differ from actual population responses. Conclusions on trends of habitats, particularly as extended to inferring potential effects on species, must be treated as tentative working hypotheses.

- *Gaps in knowledge* ~ Many of the species assessed are poorly understood and studied. Their distribution, habitat associations, interactions, and demographics are not well known.

- *Modification of EIS standards* ~ The Science Integration Team analyzed the alternatives initially in February 1996. In an effort to provide greater assurance that some or all of the alternates met the intent of the Endangered Species Act, Clean Water Act, Clean Air Act, and Federal trust responsibilites to tribes; some of the objectives and standards, particularly for riparian widths, and snag and downed wood levels, were clarified or modified. Because the alternatives were not completely rewritten, the SIT did not fully re-evaluate them, for example, the terrestrial species panels were not reconvened; however, all material was examined to consider its appropriateness with the revised alternatives. Some outcomes may be adjusted before the Final EIS is published to fully reflect these modifications.

Causes of the Effects of Each Alternative on Terrestrial Species Habitats or Populations

The Science Integration Team (SIT) assessed effects on species from a variety of influences including habitat changes at the broad scale (Lehmkuhl et al., in Quigley, Lee, and Arbelbide 1996). The team reviewed 547 vertebrates and approximately 8,000 vascular plants. Of those, 118 vertebrate species and 14 vascular plants were assessed in detail for the UCRB Draft EIS. Tables 4-41, 4-42, and 4-43, which appear later in this section, provide a summary of effects on species that were determined to be of most concern. Discussions of underlying causes for outcomes projected for these species are included in Lehmkuhl et al. (in Quigley, Lee, and Arbelbide 1996). Causes include those associated with agency management, those resulting from natural processes, and those associated with actions that are outside the control of the Forest Service or BLM. Prior to publication of the Final EIS, additional analysis is expected to further clarify reasons for habitat declines for these species and other species associated with the same habitats. This analysis will help identify any actions that may be necessary for the protection or enhancement of habitats.

The major causes for outcome rankings for terrestrial plant and vertebrate species are based on assumptions by the Terrestrial staff of the Scientific Integration Team (see Assumptions, above), the desired range of future conditions (see Chapter 3), and the objectives and standards incorporated in Chapter 3. The following are the major causes that affected the species outcomes:

- Amounts of seral stages (desired range of future condition) and transitions of structural stages through time for terrestrial communities.

- Cumulative effects off Federal lands including the conversion of native shrub/grass/forb communities to agricultural croplands in rangeland potential vegetation groups on non-Federal lands.

- Road densities and level of human disturbance.

- Changes in patch and pattern, composition, distribution, and structure of all forested PVGs (dry, moist, cold forest) and rangeland PVGs (dry grassland, dry shrublands, cool shrublands) through management activity levels including: thinning, prescribed fire, harvest, fire suppression, integrated weed management, and grazing strategies.

- Invasion and expansion of exotic plant and animal species.

- The change in quality and quantity of wetland habitats.

- Reserve design in Alternative 7.

- Interim direction of PACFISH and INFISH applied to Alternative 2.

- Adequacy of standards for some elements, including: riparian buffers, snags, downed wood, remnant large tree structure, and cave/mine/cliff protection for bat roost sites.

Methodology: How Terrestrial Species were Evaluated by the Science Integration Team

The *Evaluation of Alternatives* assessed the effects of alternatives on terrestrial species, particularly the degree to which habitat conditions on lands administered by the Forest Service or Bureau of Land Management within the project area contribute to the long-term persistence of plants and animals. All information presented here, including tables and figures, was derived from the Terrestrial Analysis (Lehmkuhl et al. 1996, in Quigley, Lee, and Arbelbide 1996), unless otherwise noted.

The analysis also examined the extent to which other lands and other influences might affect populations of species over and above the influences of habitat conditions on Federally administered lands. The evaluation is not a quantitative analysis of viable populations, because it is not an explicit model of genetic or demographic risk to species persistence. Rather, the terrestrial species evaluation provided a reasoned series of judgements about projected amounts and distributions of habitat and the likelihood that such habitat would allow populations of selected species to persist over 100 years (a different approach from that of the Landscape evaluation, which dealt with broad-scale vegetation analysis at 10, 50, and 100 years). The analysis meets the evaluation criterion of an analysis of viable populations: to provide an estimate of the likelihood that a population will persist over the long run, generally 100 years. However, it did so through the use of structured professional judgements rather than through the use of population projection models.

Methods for Assessing Species and Habitat Outcomes for Alternatives

The process for assessing species and habitat outcomes in the project area drew on previous efforts (such as FEMAT 1993) and also drew heavily on efforts made in the *Scientific Assessment* (Quigley et al. 1996a,b) during 1994 and 1995. The *Evaluation of Alternatives* provided information about the expected condition of species under each of the alternatives. The evaluation does not provide a simple conclusion for viable populations, but rather provides information needed to assess alternatives relative to the National Forest Management Act, The Endangered Species Act, The National Environmental Policy Act, and the Federal Land Policy and Management Act.

Evaluations were based on expert opinions from professional panels concerning the likely outcome for species and their habitats under the proposed management alternatives. The SIT addressed habitat outcomes and population outcomes. Outcomes are a result of the numeric rating system used by the panel in making judgements concerning the relative scores for population and habitat by alternative. The EIS Teams made inferences about viable populations from the SIT information, based on the following and other rationale presented in Appendix K.

> *Species information*: Maps of species' ranges, maps of species' locations for vascular plants, tables of species-habitat associations, information on documented population trends, information on species abundance, and information on species demographics where known.

Information for all alternatives: Projected extent of species habitat at three points in time (historical, present, and 100 years in the future); maps of management emphasis and any prescription allocations of each alternative such as reserve locations, riparian strategies and other actions; maps and tables of vegetation types projected over 100 years; projections of vegetation completed by the Landscape Analysis Team; and specific management standards for the alternatives.

Experts were asked to make judgements about the likely condition of species and their habitats. Judgements were made for the planning area for each of the alternatives and for each of the three timeframes (historical, current, and 100 years in the future). Two distinct judgements were made: (1) the likely potential distribution of species based only on habitat conditions on BLM- and Forest Service-administered land (habitat outcomes); and (2) cumulative effects of the likely conditions across all land ownerships and considering all other influences (such as pollution) on actual species populations outcomes. To determine habitat and population outcomes, a structured process was used to provide likelihood ratings using an outcome scale. The outcome scale depicted five distinct possible outcomes for a species and/or its habitat. The analysis focused on the pattern of habitats supporting an actively breeding population that produces an excess number of juveniles that may disperse to other areas.

Overview and Factors Considered in Judgements

The individual outcomes represent points along a gradient ranging from a broadly distributed condition with a strong potential of persistence (Outcome 1) to a poorly distributed condition with a high likelihood of extirpation (Outcome 5).

There was a level of uncertainty recognized by the expert panels in each of the species outcome rankings. Sources of uncertainty associated with the judgements differed for the three time frames considered. In the historical judgement, uncertainty in ranking outcomes results from both the uncertainty with the historical habitat projection and the relationship of species to that habitat. In the judgement of current condition, uncertainty results from uncertainty surrounding the habitat maps and the current distribution and condition of species' populations. In the future judgements, there was uncertainty in the habitat projection, the relationship of species habitat and unforeseen future events that might influence land management, and the response of habitat to that management. For each judgement, each expert spread 100 likelihood votes across five outcomes independently; all 100 votes had to be used. Placing 100 votes on a single outcome indicated much certainty, spreading votes among outcomes indicated less certainty in any one outcome. Consensus was not an objective of votes among different experts.

Habitat Outcomes

The following are the distinct outcomes used to describe the likely species status that could be supported by habitat conditions on BLM- or Forest Service-administered lands. The term "habitat" in the outcome description was defined as primary habitat, capable of supporting a self-replacing population.

Outcome 1: Habitat is broadly distributed across the planning area with opportunity for continuous or nearly continuous occupation by the species and little or no limitation on population interactions.

Outcome 2: Habitat is broadly distributed across the planning area, but gaps exist within this distribution. Disjunct patches of habitat are typically large enough and close enough to other patches to permit dispersal among patches and to allow species to interact as a metapopulation (local populations linked by migrants, allowing for recolonization of unoccupied habitat patches after local extinction events).

Outcome 3: Habitat exists primarily as patches, some of which are small or isolated to the degree that species interactions are limited. Local subpopulations in most of the species' range interact as a metapopulation, but some patches are so disjunct that subpopulations in those patches are essentially isolated from other populations.

Outcome 4: Habitat is typically distributed as isolated patches, with strong limitation in interactions of populations

among patches and limited opportunity for dispersal among patches. Some local populations may be extirpated, and rate of recolonization will likely be slow.

Outcome 5: Habitat is very scarce throughout the area with little or no possibility of interactions among local populations, strong potential for extirpations, and little likelihood of recolonization.

Population Outcomes

The outcome scale for cumulative effects across all ownerships was similar, but emphasized actual conditions for populations as follows:

Outcome 1: Populations are broadly distributed across the planning area, with little or no limitation on population interactions.

Outcome 2: Populations are broadly distributed across the planning area but gaps exist within this distribution. Disjunct populations are typically large enough and close enough to other populations to permit dispersal among populations to allow species to interact as a metapopulation.

Outcome 3: The species is distributed primarily as disjunct populations, some of which are small or isolated to the degree that species interactions are limited. Local subpopulations in most of the species' range interact as a metapopulation, but some populations are so disjunct that they are essentially isolated from other populations.

Outcome 4: Populations are typically distributed as isolated subpopulations, with strong limitation in interactions of subpopulations and limited opportunity for dispersal among patches. Some local populations may be extirpated and rate of recolonization of vacant habitat will likely be slow.

Outcome 5: Populations are highly isolated throughout the area with little or no possibility of interactions among local populations, strong potential for extirpations, and little likelihood of recolonization of vacant habitat.

Panelists were instructed to apply these outcomes in an absolute way in making their judgements. For example, if habitat for a species on BLM- or Forest Service-administered land existed as two large patches separated by non-Federal land, its condition would be described as Outcome 2. Similarly, if a species and its habitat existed in a naturally patchy condition, its historical condition would be described as Outcome 3 or 4. Some outcomes may not be applicable to all taxa. For example, some amphibians and plants occur naturally in a localized or patchy distribution, and thus never would occur in the conditions described in Outcomes 1, 2, or 3. This means that the best possible outcome for any species is not always Outcome 1.

Factors Considered in Judgements of Species' Response

Federal habitat judgements were based on potential species' response to the following factors:

- ◆ Amount and distribution of habitat on BLM- or Forest Service-administered lands;
- ◆ Habitat reduction causing bottlenecks and severe population decline; and
- ◆ Random environmental events, natural catastrophes, and natural variation caused by climate and other natural events.

Cumulative effects judgements were based on potential response to the following factors:

- ◆ Amount and distribution of habitat on BLM- and Forest Service-administered lands;
- ◆ Amount and distribution of habitat on non-federal lands;
- ◆ Habitat reduction causing bottlenecks and severe population decline; and
- ◆ Random environmental events and natural catastrophes, and natural variation caused by climate and other natural events; and
- ◆ Non-habitat factors, such as hunting, illegal taking of animals, and pesticides.

Methods for Analyzing Outcome Rankings

For a discussion of how the SIT analyzed the data derived from the expert panels, see Lehmkuhl et al., in Quigley, Lee, and Arbelbide 1996.

To display results for groups of species, a simplified display showed the number of species that fell into each of five classes of weighted mean outcomes. The five classes are used on many of the figures that accompany the text, figures and tables in this chapter. These classes are:

Outcome Class 1 ~ includes weighted means from 1.0 to <1.5; (strong potential for persistence)

Outcome Class 2 ~ includes weighted means from 1.5 to <2.5;

Outcome Class 3 ~ includes weighted means from 2.5 to <3.5;

Outcome Class 4 ~ includes weighted means from 3.5 to <4.5;

Outcome Class 5 ~ includes weighted means from 4.5 to 5.0. (strong potential for extirpation)

Species that showed a change of at least 0.5 (weighted mean score) downward or upward from current condition is considered a significant change. Mean likelihood scores were also used.

The EIS Team reviewed the results to ensure that they reflected an adequate understanding of the alternatives and of the landscape being analyzed. Most of the judgements reported here are identical to the results of the expert panels. If the judgements appeared to be inconsistent with projected habitat trends or with the array of standards across the alternatives, the Terrestrial staff of the SIT provided final results different from the expert panel. These differences are footnoted in the results and are documented and on file. The change from historical to current and from current to future under each alterative was determined by comparing the outcomes between time periods for each alternative.

Species were analyzed separately and also placed in groups for ease of discussion and comparison based on ecological and functional groupings. These groups are:

- plants,
- amphibians/reptiles,
- raptors/game birds,
- waterbirds/shorebirds,
- woodpeckers/nuthatches/ swifts,
- cuckoos/hummingbirds/passerines,
- bats and small mammals,
- carnivores, and
- ungulates.

Interpretation of Analysis

The intent of the analysis was to describe likely future conditions for habitats and species and provide for comparison of those conditions to current and historical conditions. Interpretation of the results emphasized comparison of projected future conditions under the alternatives to historical and current. The analysis did not provide a simple conclusion about conditions that constitute a "viable" population, because there were no simple thresholds for viability done on a broad array of taxa. Projected future conditions that result in improvements from current conditions should generally be considered as positive outcomes. Projected declines from current conditions (higher mean outcome scores) may be viewed as negative, particularly if they indicate a significant increase in the likelihood that populations will be isolated.

A change in weighted mean Outcome Class from 3 to 4 is especially significant, as mean Outcome Class 4 indicates conditions under which populations would be isolated. A change to a weighted mean Outcome Class of 5 was viewed as a serious concern; this projected change in weighted mean would result in a strong likelihood of a species' extirpation from a large portion of its range. Changes in outcomes on federal lands were the primary criteria for judging alternatives, because alternatives only addressed management of those lands.

How Species Were Selected for Analysis

An analysis was not conducted for nonvascular plants or allies (bryophytes, fungi, or lichens). It is recommended that taxa in these groups be considered for further analysis at finer geographic scales.

One hundred sixty-four plant taxa of range-wide conservation concern were evaluated with respect to their vegetation cover type associations, natural and human-caused threats to populations, and ecological characteristics. The majority of these taxa are either locally endemic in their distribution pattern or have highly specialized habitats. Outcomes for such taxa could not be appropriately analyzed at the broad scale of the scientific evaluation, but are best addressed at finer scales. See Appendix J for a list of these species needing finer scale analysis. Twenty-eight taxa of range-wide conservation concern that could appropriately be analyzed at the broad scale of the evaluation were selected for outcome analysis; 14 of these occur in the UCRB planning area and are included in the Draft EIS. (See Appendix J.)

No regional analysis was done for invertebrate species. The general nature of the alternatives and the objectives and standards would make it inappropriate to judge the fine-scale site effects of the alternatives on invertebrates. It is recommended that taxa in this group be considered for further analysis at finer geographic scale.

The Species Environment Relationships (SER) database developed for the project area lists 547 vertebrate species that occur within the project area during some part of their life history. A step-wise process was used to determine which vertebrate species should be considered for further analysis during the evaluation of alternatives. The selection process used information gathered in the SER database, and the results of a preliminary assessment done in October and November, 1995. This first analysis evaluated changes in habitat and population for all species historically and under the preliminary alternatives. For the current evaluation, species from the database were placed in four categories: species for which a finer-scale analysis is needed; species for which no further analysis is necessary because their outcomes appear secure; species for which analysis would be conducted; and species which did not fall in any of the other three categories.

Locally endemic species within the project area are most appropriately analyzed at a finer scale. Species for which no further analysis was considered necessary were those determined to be widely distributed that are common or abundant, have no recorded population or habitat declines during the historical period, and are not expected to experience habitat declines under the alternatives. Analysis was considered mandatory for species that are Federally listed or candidate species or species that have been subject to lawsuits. However, the peregrine falcon was not evaluated because there is no significant concern of losing habitat on BLM- or Forest Service-administered land and because the species is recovering. The whooping crane and the trumpeter swan were not assessed because they occur in the Greater Yellowstone Ecosystem, which is not within the planning area of the UCRB Draft EIS. Species listed as sensitive by the Forest Service or BLM were also selected for further analysis unless determined to be most suited for finer-scale analysis or considered to be little affected by Federal habitat management.
Species that did not fall in any of the above categories were examined individually to determine if there were sufficient concerns about their viability on BLM- or Forest Service-administered lands to warrant detailed analysis. Species were generally considered for further analysis if they had experienced significant habitat decline or population declines in the past or were associated with habitats expected to decline under one or more alternatives. Past declines may be attributed to 1) management activities on BLM- and Forest Service-administered lands; or 2) actions such as agricultural practices or urban development on private lands. Selections were made on an ecological basis.

Issues of harvestability of terrestrial species (see Appendix C) are outside of the scope of the evaluation criteria for the evaluation and would require a different evaluation process. In many cases, such species are widespread and relatively common or abundant, and there is little concern for their persistence within the project area.

Information used in the evaluation included literature, the SER database, the initial evaluation of alternatives conducted in 1995, and any data analysis on population trends. Of the 547 vertebrate species listed in the SER database, 335 species were not selected for analysis; 39 species were identified for further fine-scale analysis; and 173 species were selected by the SIT for analysis in the project area. Of the 173 vertebrate species analyzed, 118 occur in the UCRB planning area. See Appendix J for the respective lists of species.

EIS Team Application of Science Integration Team Information

The EIS team made inferences about viable populations from the SIT information, based on the following and on other rationale presented in Appendix K (Rationale for Viability Compliance).

- The Habitat Outcomes method was used to address the viability requirements of NFMA planning regulation 36 CFR 219.19. This method is reasonable for addressing NFMA requirements for broad-scale programmatic planning.

- Cumulative effects analysis, under NEPA requirements, was used to make inferences about populations and population persistence; this method was referred to as Population Outcomes.

Effects of the Alternatives on Terrestrial Species

General Trends: Terrestrial Species and Habitats at Risk

The Science Integration Team reviewed 547 vertebrate species and 8,000 vascular plants in the project area, of which 173 vertebrates and 28 vascular plants were analyzed. One hundred and thirty-two of the species analyzed (118 vertebrate species and 14 vascular plants) occur in the UCRB planning area and are included in the Draft EIS.

Three major trends can be determined from the evaluation of alternatives:

- There would be little change in overall habitat outcomes and viability for the majority of the species analyzed, including threatened and endangered species. This statement is true for all of the alternatives (see figures 4-17, 4-47 and 4-48). The range in percentages of species analyzed that do not demonstrate a substantial change from current outcomes, varies from a high of 96 percent in Alternative 2 to a low of 83 percent in Alternative 1.

- Alternatives 1 and 5 are projected to result in the highest number of species with an increased risk of extirpation or viability loss (see figures 4-17, 4-18, and table 4-41).

- Alternatives 4, 6, and 7 would result in higher numbers of species with improved likelihood of persistence and viability for the next 100 years (figures 4-17, 4-18, and table 4-42).

Tables 4-41, 4-42, and 4-43 portray species habitats considered at risk, either currently or through the implementation of one or more alternatives. These tables have some species in common, reflecting risks and impacts of alternatives, primarily riparian- and snag-associated species. Some species listed in table 4-41 show little differentiation among alternatives. In many cases these species are at risk or in decline for reasons other than Federal land management activities.

Table 4-41 shows species predicted to be at risk of extirpation. Several of these species are at risk in all alternatives; actions on Federal lands have little impact on these outcomes. These species or groups of species will be discussed later.

Table 4-42 lists species whose habitats are expected to improve in quality, through implementation of one or more alternatives. In general, "increaser" species (whose habitat conditions are improved from the current condition) are not seen in Alternatives 1 and 2, and are most prevalent in Alternatives 4, 6, and 7, because of standards that improve particular habitat components such as snag levels or riparian widths. For the most part, the improved habitat components fall into four types: riparian, large reserves, snag/downed wood, and rangeland.

Table 4-43 displays species habitats predicted to decrease in quantity or quality, changing from outcomes that are currently favorable to

outcomes that are significantly poorer. This table reveals that Alternatives 1 and 5 would have the highest number of species that are adversely affected, while Alternatives 4, 6, and 7 would affect the lowest number of species. Similar to table 4-42, the elements most important to the outcomes are riparian habitat, snag/downed wood levels, and rangelands. Species associated with large reserves do not show up in this table, primarily because many of those species are currently at risk and would not significantly decline in any alternative.

The risk of extirpation/viability loss for a given species was examined in two ways: (1) by a weighted mean score of Outcome Class 4 or 5, and (2) by the total number of possible points in Outcome 5 (see Methodology section). The SIT chose 20 or more points in Outcome 5 as describing some risk of extirpation.

Most of the wildlife species groups on table 4-41 whose outcomes would differ among alternatives (amphibians/reptiles, waterbirds, raptors/gamebirds, woodpeckers, and bats) can be categorized by two habitat associations: riparian habitat, or snags and downed wood. These species groups would be negatively affected by management activities in Alternatives 1 and 5, and positively affected by Alternatives 4, 6, and 7. Approximately 80 percent of the habitat for the Coeur d'Alene salamander occurs on Federal lands; because some reserves are located in this habitat, Alternative 7 is predicted to have the best outcome, while Alternatives 1 and 5, with continued habitat fragmentation and less stringent riparian buffers would have the worst outcomes. One plant, *Botrychium crenulatum*, occurs primarily on Federal land and may be negatively affected by management activities including timber harvest, road building, and trampling associated with grazing practices, especially in Alternatives 1 and 2.

Species at Risk Which Show Little Change in Outcome Class by Alternative

Several species shown in table 4-41 would have poor outcomes in all alternatives. This scenario usually means that species have been and will continue to be affected by factors other than management activities on federal lands. These species include several plant species, northern leopard frog, Columbian sharp-tailed grouse, mountain quail, yellow-billed cuckoo, spotted bat, grizzly bear, lynx, wolverine, California bighorn sheep, woodland caribou, and upland sandpiper.

- Of the plant species in table 4-41 unlikely to show changed outcomes due to the alternatives, one occurs in specialized habitats (*Haplopappus liatriformis).* Another, *Botrychium ascendens*, is not well known and has been found only in late-seral western red-cedar/grand fir; it would likely be most affected by alternatives that have highest timber harvest levels and lowest levels of riparian protection.

- Habitat declines on both Federal and non-Federal lands have affected Columbian sharp- tailed grouse, mountain quail, and yellow-billed cuckoo. Conversion of habitat to cropland has left isolated populations of sharp-tailed grouse. Fragmented riparian habitat on Federal and non-Federal land has isolated populations of mountain quail and yellow-billed cuckoo. None of these species are likely to reach favorable outcomes, as indicated in table 4-41. However, the remaining habitat is extremely important to the persistence of these species.

- Spotted bats roost primarily in cliff faces with surrounding forest, and are thought to have had patchy distribution historically. Because of continued recreation and timber harvest near cliff roost sites, there will be

Outcomes vs. Status - Outcomes are a result of the panel process and are reported by a "Weighted Mean Score" of 1 to 5 (see Methodology). Status is measured in 3 ways: (1) No change, (2) Increase, and (3) Decrease. Increase/Decrease are defined as a 0.5 change in the Weighted Mean Score. The results are reported by both measures in the text of this discussion. For example, figure 4-21 displays changes in status by alternative for plants, and figure 4-22 displays outcomes for plants by alternative.

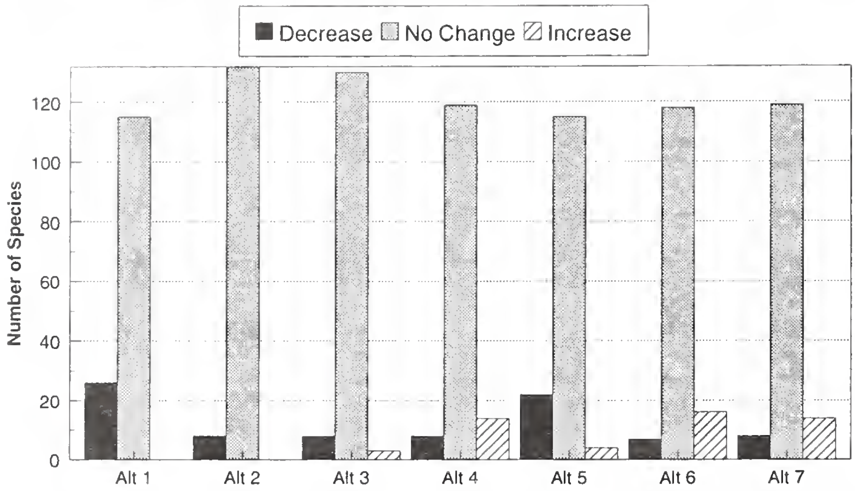


Figure 4-17. Plants and Vertebrates, Change in Habitat from Current Conditions, 132 Species, UCRB Planning Area.

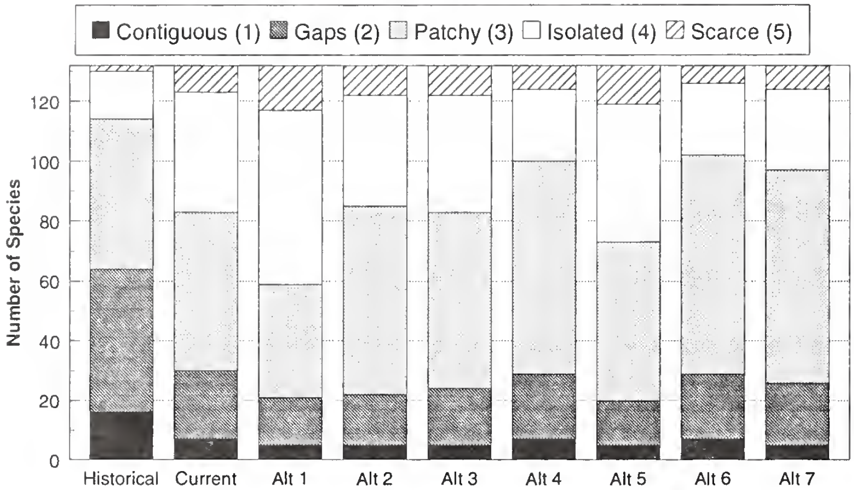


Figure 4-18. Plants and Vertebrates, Weighted Mean Outcome Scores (1-5), 132 Species, UCRB Planning Area.

more habitat disturbance in Alternatives 1 and 2 than in Alternatives 3, 4, 5, 6, and 7, which provide more protection in the standards.

◆ As a group, carnivores currently occur in patches of isolated habitat. Alternatives that promote larger blocks of habitat and improved connectivity (Alternatives 4, 6, and 7) may improve these outcomes. Where habitats remain isolated by areas of private land, the alternatives would not change outcomes.

◆ California bighorn sheep are limited throughout their range by distribution of available habitat. Reduction in density of juniper and sagebrush would improve the connectivity of bighorn sheep habitat. Alternative 4, with the most aggressive rate of habitat restoration, would have the highest likelihood of improving this habitat. However, other factors such as diseases transmitted by domestic livestock, will continue to affect the outcome of this species.

◆ Woodland caribou are at the highest risk level because of small and isolated populations (with little genetic interchange) and limited range within the project area. The small populations are likely to be affected by habitat changes (through wildfire or insects and disease) or through mountain lion predation. Unless herds are augmented, this species is likely to remain at risk.

Table 4-41. Comparison of Habitat Outcome Class on Forest Service- and BLM-administered lands, UCRB Planning Area.

			Alternatives						
Category	**Historical**	**Current**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Plants:									
Botrychium ascendens	A4	A4	C5	B4	C5	C5	C5	C5	C5
Botrychium crenulatum	A4	A4	C4	B4	B4	B4	C4	B4	B4
Haplopappus liatriformis	A2	C5	C5	C5	C5	C5	C5	C5	C5
Amphibians/Reptiles:									
Coeur d'Alene salamander	A4	B4	C5	B4	B4	B4	C5	B4	
Northern leopard frog	A3	C5	C5	C5	C5	B4	C5	B4	B4
Tailed frog	A3	A3	B4						
Woodhouse's toad	A3	A4	B4	B4	B4		B4		
Longnose leopard lizard	A4	A4	B4				B4		
Waterbirds/shorebirds:									
Goldeneyes	A4	A4	B4						
Harlequin duck	A3	C5	C5	B4	B4		C5		B4
Upland sandpiper	A2	D5	D5	C5	C5	C5	C5	C5	C5
Raptors/Gamebirds:									
Columbian sharp-tailed grouse	A1	C5	C5	C5	B4	B4	B4	B4	B4
Mountain quail	A3	C5	C5	C5	C5	C4	C5	B4	C5
Flammulated owl	A2	B4	B4						
Woodpeckers, Nuthatches & Swifts:									
Black-backed woodpecker	A2	A3	B4						
Lewis' woodpecker	A2	A3	C5				B4		
Red-naped sapsucker	A2	A3	B4						
Three-toed woodpecker	A3	A3	B4						
Vaux's swift	B4	A4	C5		B4		B4		
White-headed woodpecker	A2	A4	B4		B4				
Cuckoos, Passerines & Hummingbirds:									
Bobolink	A3	B4	B4	B4	B4		C4		B4
Grasshopper sparrow	A3	A4			B4				
Yellow-billed cuckoo	A3	B4	C5	C5	C5	B4	C5	B4	C5
Bats & Small Mammals:									
Fringed myotis	A3	A4	B4				B4		
Pale western big-eared bat	A3	A4	B4		B4		B4		
Silver-haired bat	A3	A3	B4				B4		
Spotted bat	A4	B4	B4	B4	B4	B4	C5	B4	B4
Western small-footed myotis	A2	A3	B4		B4	B4	B4		
Northern flying squirrel	A2	A3	B4				B4		
Carnivores & Ungulates:									
American marten	A2	B4	B4	B4	B4		B4		
Fisher	A3	B4	B4				B4		B4
Grizzly bear	A1	B4	B4	B4	B4	B4	B4	B4	B4
Lynx	A3	B4	C5	C5	B4	C5	C5	B4	B4
Wolverine	A3	B4	B4	B4	B4	B4	B4	B4	B4
California bighorn sheep	A4	C5	C5	C5	C5	C5	C5	C5	C5
Woodland caribou	C5	D5	D5	D5	D5	D5	D5	D5	C5
Total of "A"	**34**	**18**							
Total of "B"	**1**	**10**	**20**	**10**	**16**	**9**	**14**	**10**	**10**
Total of "C"	**1**	**6**	**13**	**8**	**7**	**6**	**13**	**4**	**7**
Total of "D"	**0**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**0**

Table 4-41. Comparison of Habitat Outcome Class on Forest Service- and BLM-administered lands, UCRB Planning Area (continued).

			Alternatives						
Category	**Historical**	**Current**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Grand Total	**36**	**36**	**35**	**19**	**24**	**16**	**28**	**15**	**17**

This table applies to Forest Service- and BLM-administered lands in the UCRB planning area. Includes all species with at least 20 points in outcome 5 for any alternative. Weighted mean scores are included for reference.

Where no score is shown, there are fewer than 20 points in Outcome 5.

A = 0-19 points in Outcome 5
B = 20-49 points in Outcome 5
C = 50-99 points in Outcome 5
D = 100 points in Outcome 5
3 or less = Favorable Outcome Class
4/5 = Less Favorable Outcome Class

Table 4-42 displays species that are projected to have substantially improved habitat conditions from the current situation (increaser species). With the exception of Alternative 1, all of the alternatives would result in significant improvements in conditions and viability for at least some species. Alternatives 6, 7, and 4, respectively, would result in the greatest number of increaser species. Alternative 6 would result in the highest number of species projected to change from a risk of extirpation to a high likelihood of persistence and viability.

All of the alternatives would result in declining conditions for at least some species; these species are referred to as "decreasers." Table 4-43 displays those species that are projected to change from having a high likelihood of persistence and viability, to having some risk of extirpation for a given alternative.

Table 4-43 shows that Alternatives 1 and 5 would result in the highest number of species (25 and 18 species respectively) that change from a high likelihood of persistence and viability (Outcome Classes 1, 2, and 3) to having a risk of extirpation/viability loss (Outcome Classes 4 and 5), out of 132 total species analyzed. Percentage-wise, Alternatives 1 and 5 would have a negative effect on 19 percent and 14 percent of the species in the UCRB area. Alternatives 4, 6, and 7 have a negative effect on 2 percent, 2 percent, and less than 1 percent of species. Alternatives 2 and 3 are intermediate, with 5 and 7 percent of species that change from a likelihood of persisting to a risk of extirpation or viability loss.

Historically there were 18 species with weighted mean scores of Outcome Class 4 or 5, while currently there are 51 species in the planning area with a weighted mean outcome score of Outcome Class 4 or 5 (figure 4-19). This group of species could be defined as having outcomes that suggest some level of concern for their long-term viability. By tracking the weighted mean scores for this group of species by alternative and by continually referencing historical conditions, it is possible to get a relative sense of the effect the alternatives would have on improving the long-term viability of terrestrial species. In figure 4-19, departure from historical conditions is judged by the height of the bar above the historical background reference. Improvement in conditions, compared to the current situation, is displayed by the difference in the size of the bar.

Alternatives 4, 6, and 7 would result in the greatest improvement in habitat outcomes for this group of species. Alternatives 1, 2, 3, and 5 would result in a reduced number of species; however, the total reduction would be minimal (figure 4-19).

Table 4-42. Increasers ~ Species Habitats that Would Improve, UCRB Planning Area.

Species	Current	Alternatives 1[1]	2	3	4	5	6	7
Penstemon lemhiensis	3.7*			3.2	3.1	3.2	3.1	
Northern leopard frog	4.7*						4.2	3.9
Harlequin duck	4.5*				3.5		3.5	
Band-tailed pigeon	4.1*			3.5	3.5	3.6	3.5	3.4**
Columbian sharp-tailed grouse	4.8*			4.1	4.0	4.1	4.1	
Sage grouse	3.1				2.2	2.6	2.2	2.6
Bald eagle	3.6*		3.1**	3.0**	2.9**	3.0**	2.9**	3.0**
Boreal owl	3.7*			3.2**	3.2**	3.2**	3.1**	3.0**
Cooper's hawk	2.4				1.9		1.9	
Ferruginous hawk	3.0				2.5		2.5	
Flammulated owl	3.8*			3.1**	2.9**	3.1**	3.0**	3.3**
Great gray owl	3.5*				3.0		3.0	
Lewis' woodpecker	3.4				2.7**		2.7**	2.7**
Pileated woodpecker	3.4				2.5		2.5	2.6
Red-naped sapsucker	3.2				2.7		2.7	
Vaux's swift	3.8*							2.9**
White-headed woodpecker	3.8*				2.7**	3.3**	2.7**	3.1**
Chestnut-backed chickadee	3.2							2.6
Hammond's flycatcher	3.4				2.9**		2.8**	2.9**
Western bluebird	3.0				2.4		2.3	
Long-legged myotis	3.7*				3.2**		3.1**	
Silver-haired bat	3.4						2.9	
Northern flying squirrel	3.5*				3.0		2.9**	3.0**
American marten	3.7*				3.0**		3.0**	2.7**
Woodland caribou	5.0*							4.5
Totals:	25	0	1	6	20	8	22	15

This table applies to the UCRB planning area. Increasers are species whose habitat would improve (by 0.5 or more) under an alternative. That is, the outcome under an alternative would decrease by at least 0.5.

[1] Where no score is shown, improvement is less than 0.5

* = Species with less favorable outcomes (3.5+).

** = Favorable outcomes (less than 3.5) projected to result from alternative implementation ~ represents a significant improvement in habitat conditions.

Table 4-43. Decreasers - Species Habitats With a Favorable Outcome That Would Change to a Less Favorable Outcome, UCRB Planning Area.

Species	Current	Alternative 1	2	3	4	5	6	7
Astragalus mulfordiae	3	4	4	4	4	4	4	4
Astragalus oniciformis	3	4	4	4	4	4	4	
Columbian spotted frog	3	4				4		
Tailed frog	3	4				4		
Western frog	3	4				4		
Herons, egrets	3	4						
Greater sandhill crane	3	4						
Black-backed woodpecker	3	4				4		
Lewis' woodpecker	3	5				4		
Pileated woodpecker	3	4	4	4				
Pygmy rabbit	3	4						
Red-naped sapsucker	3	4				4		
Three-toed woodpecker	3	4						
White-breasted nuthatch	3	4						
Williamson's sapsucker	3	4				4		
Broad-tailed hummingbird	3			4		4		
Chestnut-backed chickadee	3	4				4		
Hammond's flycatcher	3	4		4		4		
Western bluebird	3	4						
Wilson's warbler	3	4	4	4		4		
Willow flycatcher	3	4	4	4		4		
Yellow warbler	3	4				4		
Bushtit	3					4		
Hoary bat	3	4	4	4		4		
Silver-haired bat	3	4				4		
Western small-footed bat	3	4		4	4			
Total Number of Species		**25**	**6**	**9**	**3**	**18**	**2**	**1**
Percent of Total (132) Species Analyzed		**19%**	**5%**	**7%**	**2%**	**14%**	**2%**	**<1%**

This table applies to the UCRB planning area. Where no score is shown, outcome is unchanged or improved.

Favorable Outcome = a weighted mean score of (less than 3.5)

Less Favorable Outcome = a weighted mean score of (3.5 +)

The grizzly bear and the Columbian sharp-tailed grouse would have the greatest change in habitat outcomes when comparing historical conditions with current conditions (figure 4-20). Projections for grizzly bear in all alternatives show very little change compared with the current situation. For Columbian sharp-tailed grouse, there would be small but significant improvements projected for Alternatives 3 through 6.

The changes in habitat continuity for grizzly bears have resulted from the construction of major interstate freeway systems, increasing human habitation of rural areas, and increased access on public lands. Habitat quality and availability for the Columbian sharp-tailed grouse has been diminished by conversion of native shrub-steppe to agricultural croplands, invasion of exotic species, and human habitation. In the context of this analysis, these are the only two species that would show a change in habitat conditions of this magnitude.

Results from Analysis of Species Groups

Vascular Plants

The majority of the vascular plant species for which long-term viability is a concern are either very restricted in their geographic distributions, or have broader distributions but are associated with highly specialized habitats. Species with limited geographic ranges are classified as endemics; they are often represented by low

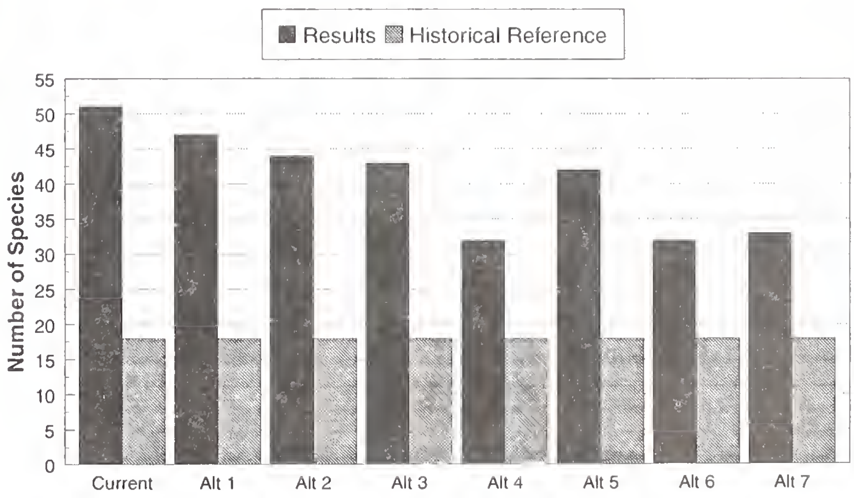


Figure 4-19. Number of Species Projected to Retain a Weighted Mean Outcome Score of 4 or 5, UCRB Planning Area.

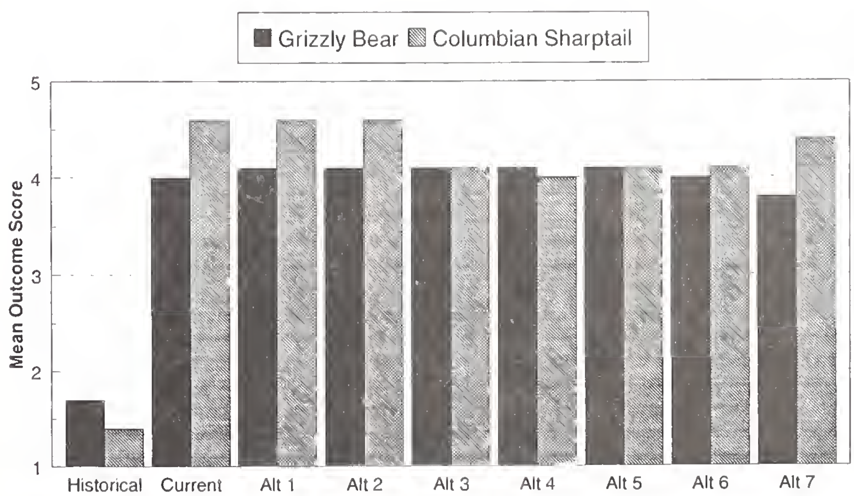


Figure 4-20. Two Species with the Greatest Magnitude of Change in Habitat Quality, Historical to Current, UCRB Planning Area.

population numbers, and may be more susceptible to localized extirpations. These geographically restricted or ecologically specialized species are not evaluated here, as they require analysis at finer planning scales. Exceptions include water howellia, MacFarlane's four-o'clock (which were analyzed because they are Federally listed), and *Spiranthes diluvialis* (which was only qualitatively evaluated due to its recent discovery). The 12 other plant species assessed include only those that, by virtue of their broader distributions or more general habitat associations, could be addressed under the alternatives.

Most of the 14 vascular plant species analyzed are predicted to have little change in status compared to current conditions (figure 4-21). Certain species of *Botrychium* are predicted to have decreased habitat quality under some (*B. crenulatum*) or all (*B. ascendens*) alternatives due to timber harvest. These fern allies are known to be associated with mature and late-seral structures in moist forests. Habitat for *Astragalus mulfordiae*, a species of upland shrub habitats, is predicted to decrease under Alternative 1, owing to continued grazing and invasion of exotic plant species. The habitat of *Penstemon lemhiensis*, a species of upland shrub habitats, is expected to increase in quality under Alternatives 3, 4, 5, and 6, due to the influence of restoration activities. Weighted mean outcomes for these vascular plants would also have limited variability across alternatives, with little difference in predicted outcomes for most species (figure 4-22). Implementation of the restoration prescriptions emphasized in Alternatives 4 and 6 are expected to provide the most suitable conditions for rare plants over the long term. Specifically, management activities that include maintenance or creation of canopy openings via silvicultural treatments or prescribed burning were rated as more likely to produce favorable habitat and population conditions for rare plants associated with early- and mid-seral vegetation stages.

Cumulative effects of loss of habitat and populations on non-Federal lands have been greatest in the Palouse prairie (ERU 6) and low-elevation upland shrub communities, specifically the sagebrush steppe region of the upper Snake and Columbia river plains (ERUs 11 and 5). In the upland shrub communities, the loss has resulted from habitat conversion to non-native grass seedings, and changes in vegetation stages and composition caused by alteration of natural fire regimes, grazing, and the spread of exotic plant species. The species of greatest concern with respect to cumulative habitat loss in these plant communities are *Calochortus nitidus* and *Haplopappus liatriformis* in the Palouse grasslands, and *Astragalus mulfordiae*, *Astragalus oniciformis*, *Astragalus yoder-williamsii*, and *Penstemon lemhiensis* in the upland shrub habitats. In these cases, the critical role that Federal lands play as strongholds for the remaining habitats and populations was recognized in the analysis.

Amphibians and Riparian-Associated Reptiles

Amphibians evaluated include: the Columbian spotted frog, northern leopard frog, tailed frog, western toad, Woodhouse's toad, and Coeur d'Alene salamander. The results are shown in figures 4-23 and 4-24. In general, the important habitat components for amphibians and riparian-associated reptiles are those which provide cool, moist environments; cool water; coarse woody debris; and protection of headwater streams.

Riparian-associated reptiles include the garter snake and the painted turtle. Riparian buffers around intermittent streams and wetlands, the level of harvest in currently undisturbed forest land, grazing intensity, and restoration were some important considerations used to evaluate the effects of alternatives on these species. Habitat conditions for most riparian-associated species have declined from historical conditions. Habitat decline for amphibians is tied to increased human disturbance, fragmentation of habitat, and reduced riparian acreage and quality of habitat. Habitat that was historically broadly or patchily distributed has been reduced to habitat that is distributed as isolated patches resulting in strong limitations on interactions between populations.

Alternatives 2, 3, 4, 6, and 7 would generally result in no change or a slight improvement in status for amphibians and riparian-associated reptiles because they provide habitat quality, quantity, and distribution that is similar to the current habitat conditions. Alternatives 6 and 7 would result in more favorable outcomes for amphibians and riparian-associated reptiles.

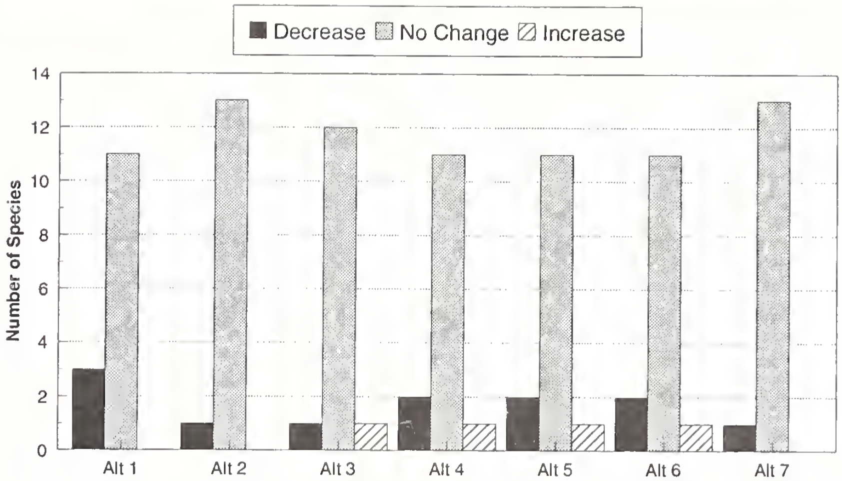


Figure 4-21. Vascular Plants, Change in Habitat from Current Conditions, 14 Species, UCRB Planning Area.

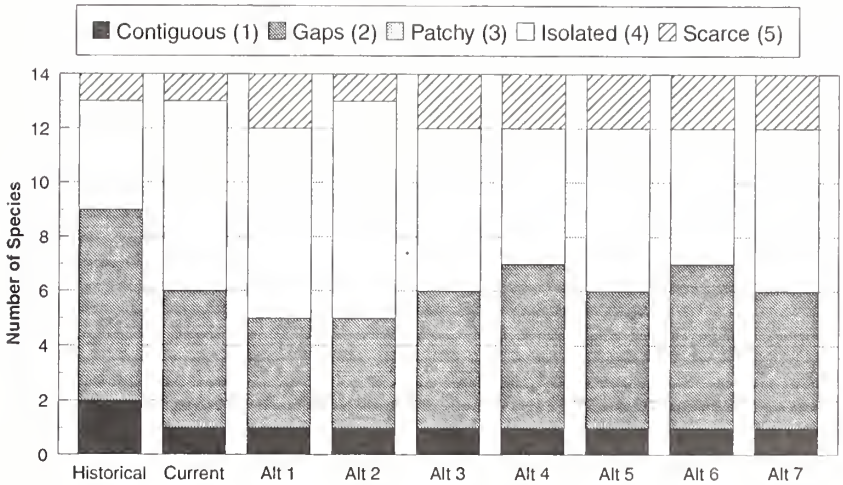


Figure 4-22. Vascular Plants, Weighted Mean Outcome Scores (1-5), 14 Species, UCRB Planning Area.

Further habitat decline for the riparian associated species is generally projected under Alternatives 1 and 5. Alternative 3 would be less favorable for the Woodhouse's toad and northern leopard frog because of predicted increases in habitat isolation.

Cumulative effects are of concern for amphibians and riparian-associated reptiles. Land management activity on non-Federal lands would affect nearly all amphibians and riparian-associated reptiles. The general trend is towards more isolation of populations and in some cases trend strongly toward higher risks to extirpation or viability loss. This trend is consistent with Alternatives 1, 2, 3, and 5 for the painted turtle. The cumulative effects on populations generally reflect the viewpoint that effects of past management and disturbance cannot be fully mitigated within 100 years. Populations are declining partly as a result of factors not greatly influenced by the alternatives, including pesticide accumulation, private land modification, and predation.

Reptiles

Predicted habitat changes for 10 reptiles are shown in figures 4-25 and 4-26. Current conditions have declined only slightly from historical conditions. The effects on habitat do not vary significantly (less than 0.5 weighted mean outcome score) across the alternatives. Generally, Alternatives 2, 3, 4, 6, and 7 would be more favorable for reptiles because they would result in habitat quality, quantity, and distribution that are similar to or slightly improved from the current habitat conditions (figure 4-25).

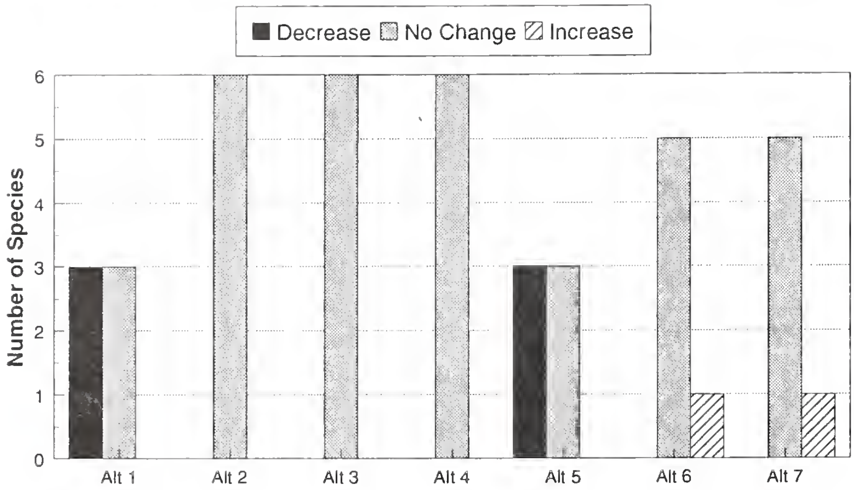


Figure 4-23. Amphibians, Change in Habitat from Current Conditions, 6 Species, UCRB Planning Area.

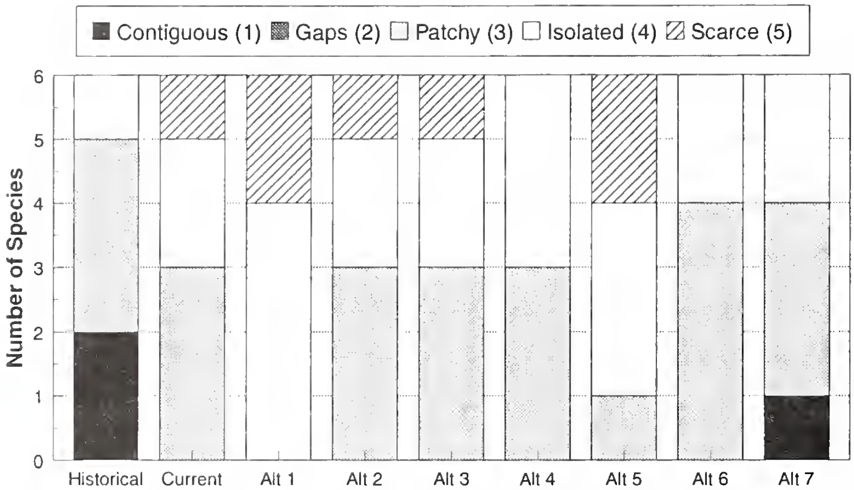


Figure 4-24. Amphibians, Weighted Mean Outcome Scores (1-5), 6 Species, UCRB Planning Area.

lAlternatives 6 and 7 are projected to provide the best habitat components for these species (figure 4-26). Further habitat decline for reptile species is generally projected under Alternatives 1 and 5, resulting from an expected increase in isolation of habitat. Further decline on BLM- and Forest Service-administered lands is projected due to invasion of exotic weeds under Alternatives 1 and 5. Effects on other reptiles (Mojave black-collared lizard, longnose leopard lizard, and rubber boa) suggest a greater decline from historical habitat conditions for some of the rangeland-associated species. Population declines are generally related to historical conversion of rangeland to agricultural use and introductions of exotic weeds, sueh as cheatgrass, which become established as monocultures; fragmentation of suitable habitat; reservoir development; and riparian vegetation loss.

Cumulative effects generally trend toward somewhat more isolated populations. There is some concern for the striped whipsnake because of somewhat more isolated populations.

Bird Groups

Four separate expert panels assessed 133 bird species, and the results are reported by the following species groups:

- ◆Waterbirds and shorebirds
- ◆Raptors and gamebirds
- ◆Woodpeckers/nuthatches/swifts
- ◆Cuckoos/hummingbirds/passerines
  - ◆Forest birds
  - ◆Grass/shrub birds
  - ◆Woodland birds
  - ◆Riparian birds

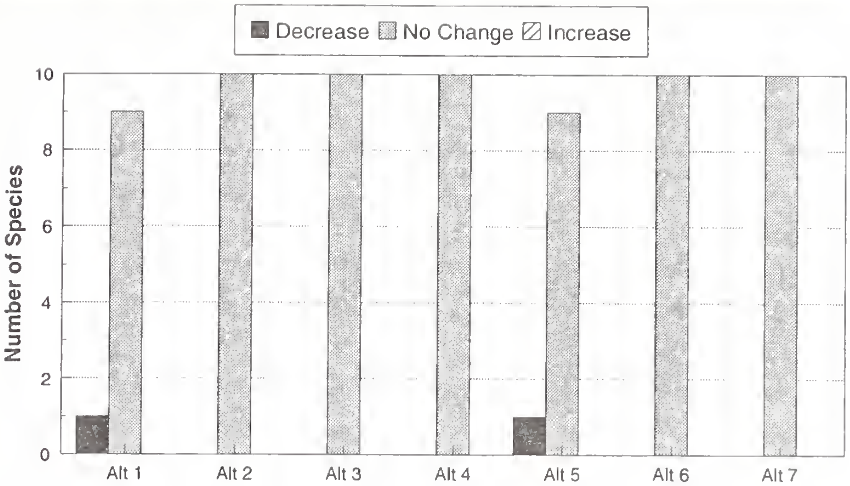


Figure 4-25. Reptiles, Change in Habitat from Current Conditions, 10 Species, UCRB Planning Area.

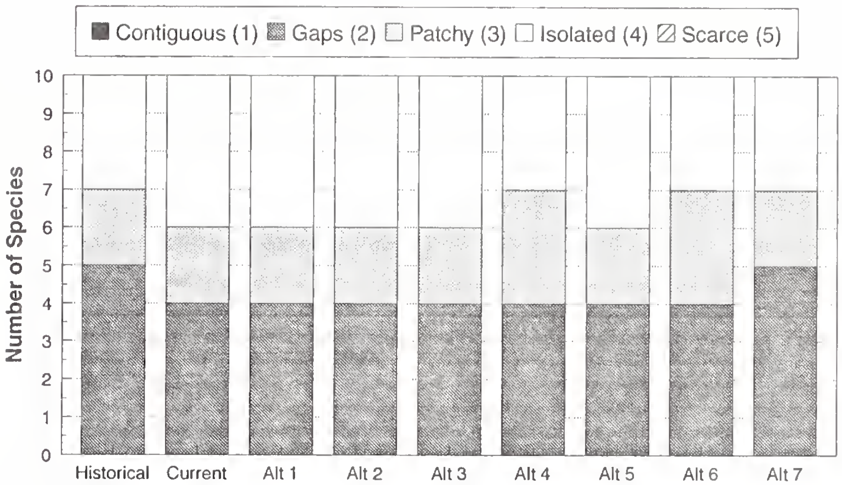


Figure 4-26. Reptiles, Weighted Mean Outcome Scores (1-5), 10 Species, UCRB Planning Area.

Waterbirds and Shorebirds

Figures 4-27 and 4-28 display predicted habitat changes for 65 species of waterbirds and shorebirds, which were divided into 15 groups for evaluation. A complete list of waterbirds and shorebirds can be found in Appendix J. No groups were judged to have been widely distributed historically, and none currently are widely distributed. In general, the important habitat components for waterbirds and shorebirds are those that provide high quality riparian stream habitat and wetland habitat with natural fluctuations in water levels. The resulting conditions provide important food items early in the spring which persist well into the drier season, as well as open water with protection from predation, clear flowing cool water, and nesting habitat within the wetlands and adjacent woody vegetation. Projected outcomes for waterbirds and shorebirds as a whole changed very little from current because alternatives had little planned manipulation of primary wetland habitat (beneficial or harmful).

Alternatives 4 and 6 are predicted to have the most favorable viability outcomes, improving habitat from current conditions to nearly approach historical conditions for wood ducks, mergansers, and harlequin ducks. The upland sandpiper is the only species rated in Outcome Class 5, due to loss of grassland habitats and over-hunting. These alternatives are predicted to be successful in increasing water quality in streams, maintaining riparian herbaceous and woody vegetation through management of natural and human disturbance, increasing snags in riparian and adjacent uplands for cavity nesters, and managing grazing of upland grasslands to reduce negative impacts to breeding birds or creating beneficial effects.

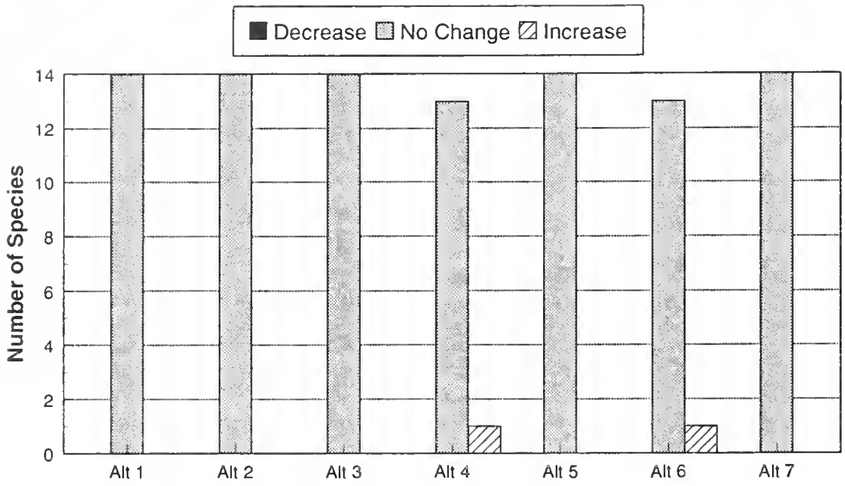


Figure 4-27. Waterbirds and Shorebirds, Change in Habitat from Current Conditions, 14 Species Groups, UCRB Planning Area.

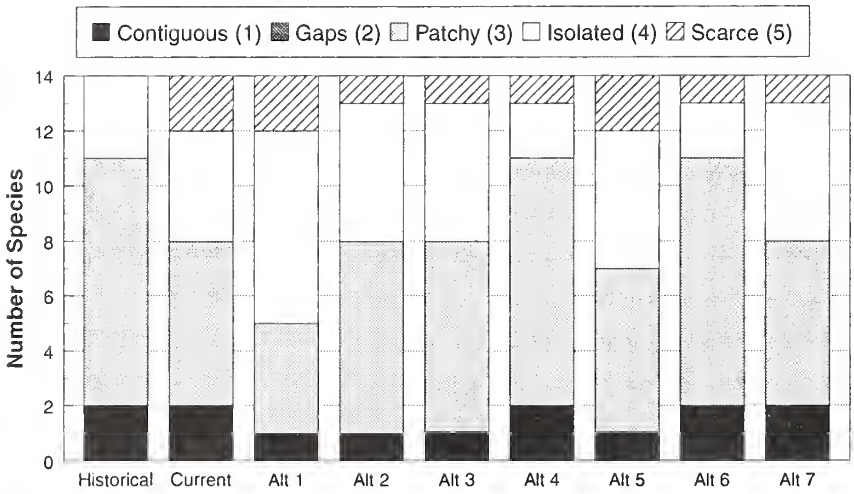


Figure 4-28. Waterbirds and Shorebirds, Weighted Mean Outcome Scores (1-5), 14 Species Groups, UCRB Planning Area.

Alternative 7, with more restrictions to management inside reserves, is not expected to be more favorable than alternatives that allowed for active management restoration. Wetlands were not expected to change in extent on BLM- or Forest Service-administered lands under the alternatives, except for natural fluctuation due to the hydrologic cycle.

Substantial improvement in harlequin duck habitat was predicted under Alternatives 4 and 6 as a result of watershed restoration that improved water quality, reduced streamside disturbance, and improved riparian vegetation.

Cumulative effects for waterbirds and shorebirds take into consideration the great extent of wetlands on other federal and private lands. Positive effects of habitat improvement on BLM- and Forest Service-administered lands, in many cases, were offset by negative factors such as the accumulation of pesticides and other toxic substances in wetlands, degradation of wetlands on private lands, degradation of wintering grounds, population declines south of the U.S. border, urban and industrial development, pollution, and human activities in marine wintering areas.

Raptors and Gamebirds

Four gamebirds, four hawks, nine owls, the band-tailed pigeon, the bald eagle, and the merlin (20 total species) were considered for analysis. Predicted outcomes for raptors and gamebirds are shown in figures 4-29 and 4-30. This group is associated with a broad range of habitat types. Eight of the 20 species are primarily forest-associated, 5 are shrubland and grassland associates, 3 are riparian

associates, and 4 are woodland associates. Historical habitat patterns for these species were more broadly distributed than at present (figure 4-30). All of the species are associated with habitats that have declined from historical conditions or are expected to decline under one or more of the alternatives.

Average outcome scores would be most favorable under Alternatives 4 and 6, when compared to other alternatives. Alternatives 3, 5, and 7, would have intermediate results. Least favorable outcomes are projected for Alternatives 1 and 2 (figure 4-30). Boreal owl habitat was known to be disjunct and supported isolated populations historically. This condition is not expected to change. Columbian sharp-tailed grouse and mountain quail are rated as Outcome Class 5 in all alternatives.

There were some species with historical habitat conditions rated as Outcome Class 1 which include: the Columbian sharp-tailed grouse, burrowing owl, northern pygmy owl, and northern saw-whet owl. For those species that are more closely associated with shrub steppe, native grassland, and shrubby riparian environments (such as Columbian sharp-tailed grouse, mountain quail, sage grouse, ferruginous hawk, Swainson's hawk, merlin, long-eared owl, northern pygmy owls, and northern saw-whet owl), habitat is projected to have declined from historical levels. The decline can be attributed to the conversion of native grasslands and shrublands to introduced cheatgrass and crested wheatgrass, agriculture, reduction in riparian shrub cover, and changes in riparian shrub species from over-grazing, which has resulted in a pattern of increased patchiness and increased habitat isolation.

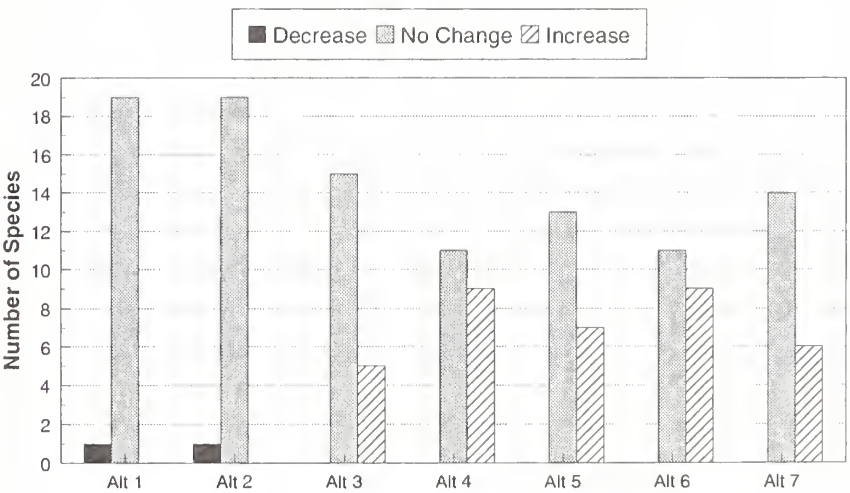


Figure 4-29. Raptors and Gamebirds, Change in Habitat from Current Conditions, 20 Species, UCRB Planning Area.

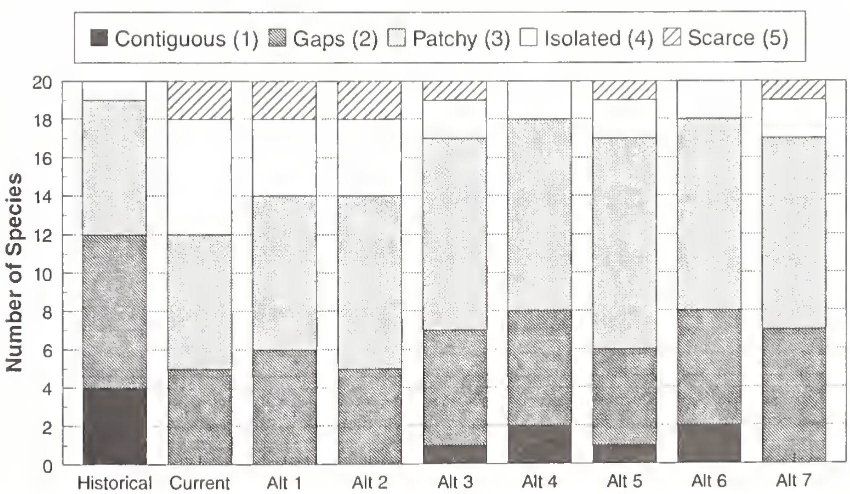


Figure 4-30. Raptors and Gamebirds, Weighted Mean Outcome Scores (1-5), 20 Species, UCRB Planning Area.

The blue grouse, band-tailed pigeon, Cooper's hawk, northern goshawk, flammulated owl, great gray owl, northern pygmy owl, northern saw-whet owl, and boreal owl use a mixture of forest types and seral stages. Current management practices, such as traditional timber harvest and fire suppression, which change fire regimes, result in a decline in the mix of seral stages used by these species.

Restoration through forest management practices would benefit these species under Alternatives 4 and 6, which promote a mix of forest structures including small openings created by frequent, small-scale disturbance; clumps of trees of differing densities; a combination of multi-age and single-age stands; and promotion of aspen regeneration.

Regarding the restoration of native shrubland and grassland communities, because of a more active approach to restoration, habitat outcomes are expected to be somewhat better under Alternatives 4 and 6 than under Alternatives 3 and 5. The overall difference, however, would not be large because of the uncertainty surrounding the ability to actively restore the native shrubland and herbland communities. For Columbian sharp-tailed grouse, because they exist as only remnant populations, habitat conditions are projected to remain significantly below historical conditions, with habitat capable of supporting only scattered populations. Under Alternatives 1 and 2, there is a high likelihood (greater than 50 percent) of local extirpations for Columbian sharp-tailed grouse.

Woodpeckers, Nuthatches, and Swifts

The SIT assessed and made habitat outcome predictions for nine species of woodpecker (black-backed woodpecker, downy woodpecker, hairy woodpecker, Lewis's woodpecker, pileated woodpecker, red-naped sapsucker, three-toed woodpecker, white-headed woodpecker, and Williamson's woodpecker); two species of nuthatch (pygmy nuthatch and white-breasted nuthatch); and one species of swift (Vaux's swift). The SIT recommended that assessment of yellow-bellied sapsucker and red-breasted sapsucker be conducted at a finer scale because of their local distributions within the project area. Species were selected for the evaluation because their habitats were projected to decline under at least one of the alternatives. All of the selected species are cavity-nesters that require snags for nesting and/or foraging. Optimal habitat for most cavity nesters consists of mature/old forests where the occurrence of large snags is the greatest.

The predicted outcomes for woodpeckers, nuthatches, and swifts are shown in figures 4-31 and 4-32. Habitat conditions for the Vaux's swift had the least favorable outcomes. Alternative 1 is projected to result in a decrease in status for most of the species in this group (figure 4-31). Alternatives 2 and 3 represent little change from current conditions. Alternatives 4, 6, and 7 are projected to improve the status of 33 percent of the species in this group (figure 4-31). Alternative 5 would likely decrease habitat conditions for 33 percent of these species. Alternative 7 represents the only alternative projected to have fully favorable outcomes (figure 4-32).

The **cumulative effects** analysis predicted greater risk to this species group due to loss of adequate nesting habitat. Additionally, Vaux's swift, which is a migrant species (unlike most other cavity nesting species that are permanent residents), is subject to loss of habitat on the wintering ground. Lewis's woodpecker would likely experience increased loss of suitable nesting habitat along streams on non-Federal land.

Cuckoos, Hummingbirds, and Passerines

Thirty six species were selected for detailed analysis for the UCRB by the Science Integration Team. It was recommended that 4 species (black-chinned sparrow, clay-colored sparrow, hermit warbler, and least flycatcher) be considered for finer-scale analysis because of their local distributions within the planning area. Because of the large number of species involved in this group, it was further divided into four categories by habitat association: 13 species associated with coniferous forest habitat, 12 species associated with grass/shrub habitats, 4 species associated with woodland habitats, and 7 species associated with riparian habitat.

Forest-associated Birds. Predicted effects on the 13 species of forest birds are shown in figures 4-33 and 4-34. Alternatives 1 and 5 would result in a decrease in status for some species. Conversely, Alternatives 4, 6, and 7

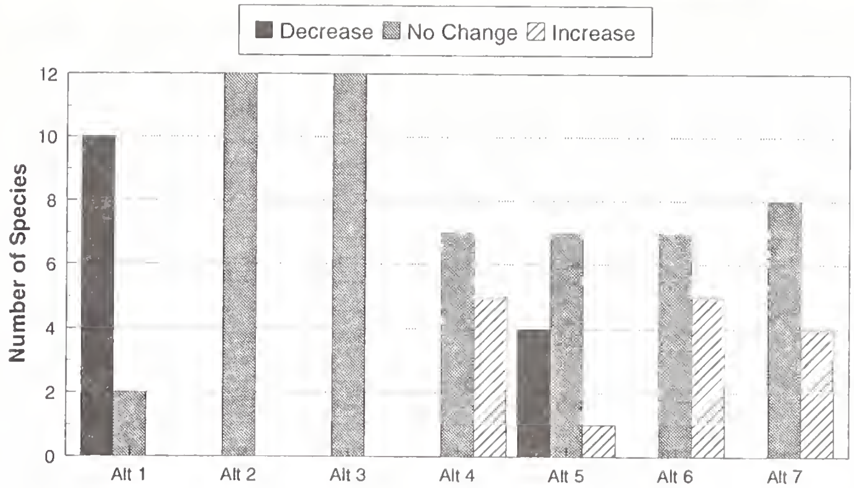


Figure 4-31. Woodpeckers, Nuthatches, and Swifts, Change in Habitat from Current Conditions, 12 Species, UCRB Planning Area.

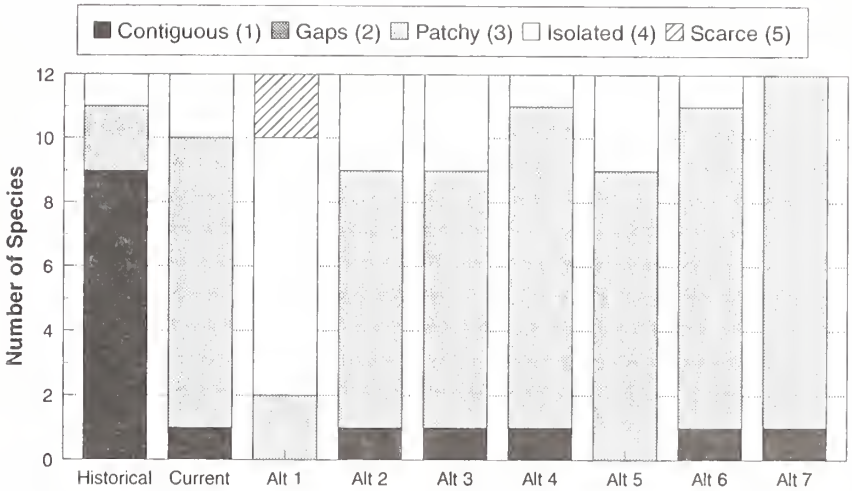


Figure 4-32. Woodpeckers, Nuthatches, and Swifts, Weighted Mean Outcome Scores (1-5), 12 Species, UCRB Planning Area.

would result in an increase in status for one of the 13 species analyzed. Alternatives 2 and 3 would result in no change from current conditions for all 13 species (figure 4-33).

Under all alternatives, western tanager was judged to have broadly distributed habitat. Management practices, including changes in fire regimes from fire suppression activities, have reduced the availability of mature/old forest, resulting in a decline in habitat from historical to current conditions. Overall, birds associated with coniferous forest habitats were generally projected to maintain relatively well-distributed habitat (figures 4-33 and 4-34). However, a few species (Hammond's flycatcher, winter wren, olive-sided flycatcher, and Wilson's warbler) have less favorable outcomes than the majority of the birds in this group. Hammond's flycatcher and winter wren are more closely associated with late-seral forest, particularly ponderosa pine. Wilson's warblers occur in mid-seral forest as well as riparian shrub communities, and their habitat outcomes were judged to be patchy and disjunct both historically and currently. This condition is not expected to change.

Restoration of these habitats under Alternatives 4 and 6 through forest management practices that promote a mix of forest structures (including small openings created by frequent, small-scale disturbance; clumps of trees of differing densities; and a combination of multi-age and single-age stands) would produce more favorable viability outcomes than other alternatives. Alternative 7, with retention of late-seral forest, was also projected to create a more contiguous distribution of habitat. Wilson's warblers occur in mid-seral forest as well as riparian shrub communities, and their habitat outcomes were judged to be patchy and

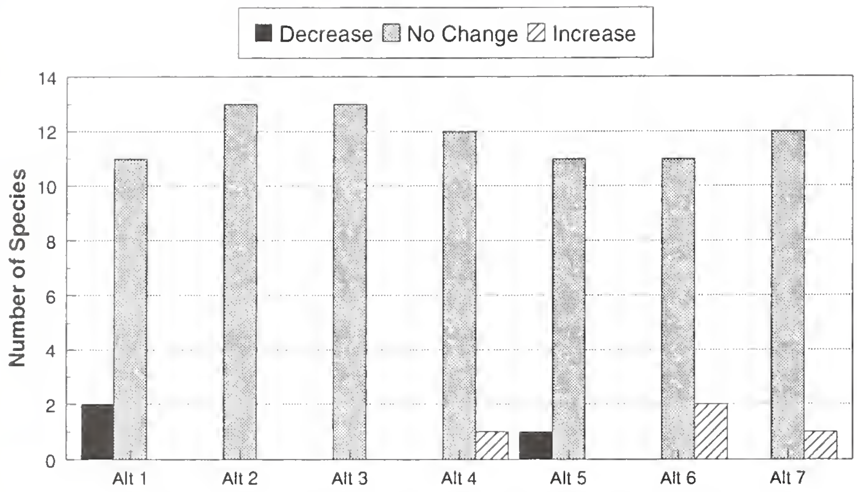


Figure 4-33. Forest Birds, Change in Habitat from Current Conditions, 13 Species, UCRB Planning Area.

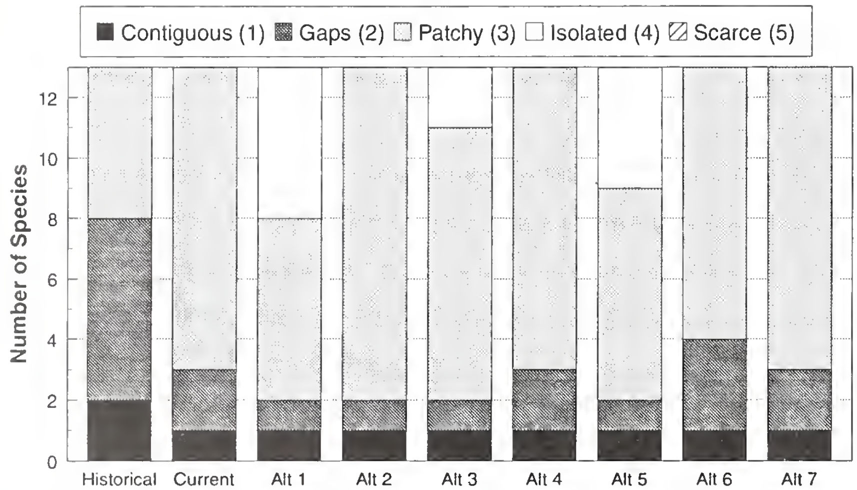


Figure 4-34. Forest Birds, Weighted Mean Outcome Scores (1-5), 13 Species, UCRB Planningt Area.

disjunct historically and currently; they are expected to remain that way under all the alternatives.

Grass/shrub-associated Birds. Habitat declines for this group of 12 species have resulted from conversion of native grasslands and shrublands due to agriculture cropland conversions, introduced stands of crested wheatgrass and other exotic plant species expansions, and reduction in riparian shrub cover. The results are a change in the pattern of native grasslands and shrublands. The number of species expected to have no change in status is projected to equal the number of species projected to decrease in status under Alternatives 1, 2, 3, 5, and 7 (figure 4-35). Under Alternatives 4 and 6, the number of species projected to have no change in status would be higher than those projected to decrease in status (figure 4-35). All of the alternatives are projected to have outcomes that are less than favorable for some species (figure 4-36).

Three species associated with grass/shrub habitat (bobolink, grasshopper sparrow, and black rosy finch) had current and projected future habitat outcomes that were least favorable. Bobolink are associated with moist grasslands, and their populations have undergone marked declines likely resulting from habitat loss on wintering grounds. Habitat for the bobolink was judged to be disjunct and patchy both currently and under all the alternatives. The grasshopper sparrow, associated with Palouse prairie and other native bunchgrasses ranges, has declined from historical levels due to conversion to agriculture. Their habitat was judged to be patchy and disjunct under all alternatives

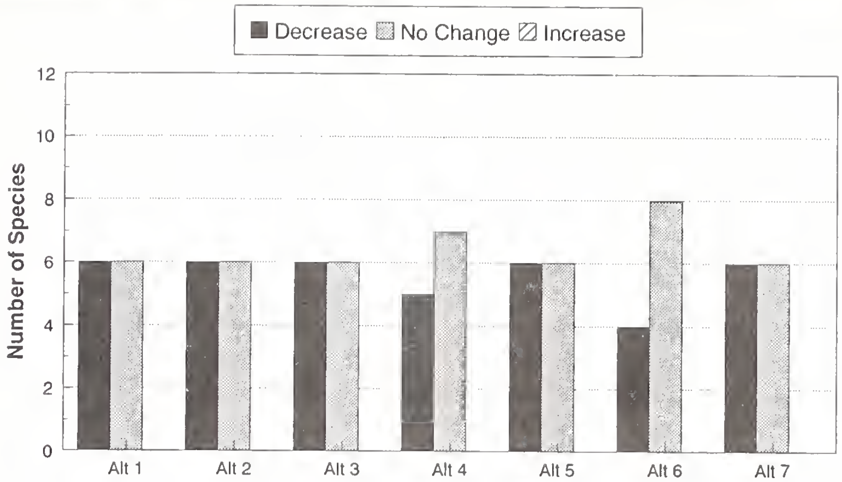


Figure 4-35. Grass/Shrub Birds, Change in Habitat from Current Conditions, 12 Species, UCRB Planning Area.

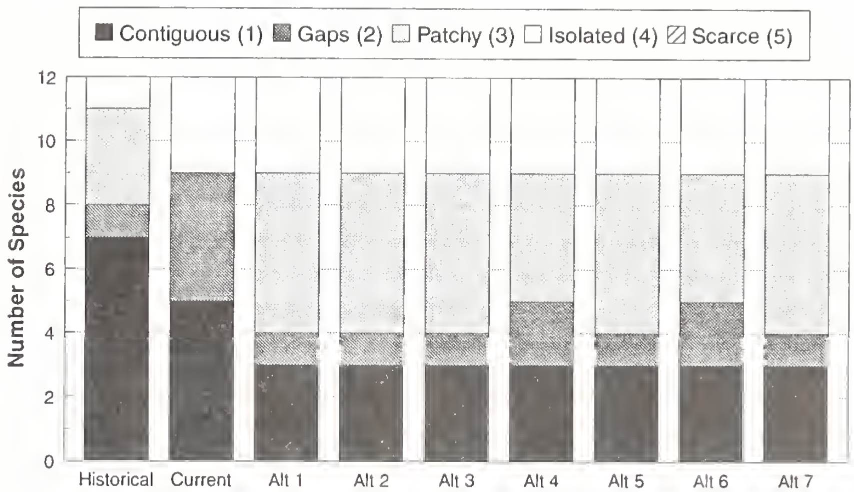


Figure 4-36. Grass/Shrub Birds, Weighted Mean Outcome Scores (1-5), 12 Species, UCRB Planning Area.

(figure 4-36). The black rosy finch, associated with alpine and barren habitats at higher elevations, has a naturally patchy and disjunct distribution of habitat; no change in this condition is expected.

Alternatives 4 and 6 would result in a broader and more contiguous distribution of favorable habitat than Alternatives 1, 2, 3, 5, and 7. Because of greater emphasis on restoration of native grassland and shrubland communities, outcomes are expected to be somewhat better under Alternatives 4 and 6 than under other alternatives. The overall difference, however, is not large because of the uncertainty surrounding the ability to actively restore the native shrubland and herbland communities.

Average outcomes were predicted to be less favorable under a **cumulative effects** analysis than under an analysis for BLM- or Forest Service-administered lands. Many of these species are neotropical migratory birds that migrate at least as far as Central America and are subject to increased risk on their wintering grounds. Many of the species are insect-eating species and are subject to natural fluctuations of insect populations. Insect populations may be depressed due to pesticide spraying, particularly on non-Federal lands (Saab and Rich in press). Species associated with grassland environments will continue to be subject to habitat declines due to cheatgrass and other exotic weed expansion especially on non-Federal lands. On shrubland habitats, cheatgrass and exotic weeds will be reduced in Alternatives 3 and 4. On some sites in the planning area, shrub/steppe habitats have had an increase in area, increase in stand density, and a shift towards older, more decadent

sagebrush stands. However, widespread conversion of sagebrush to agriculture on non-Federal lands has significantly reduced the overall amount of suitable sagebrush habitat. Species associated with sagebrush have generally been subject to an overall substantial decline in habitat.

Woodland-associated Birds. Results for woodland birds are shown in figures 4-37 and 4-38. This group of four species has projected outcomes that are inconsistent with the outcomes for all other groups of species considered in the assessment (figure 4-38). This result is based on projections for Alternatives 4 and 6, which would result in a reduction in status for a number of species compared with current conditions and all other alternatives. No change in status is predicted for these species in both Alternatives 1 and 2 (figure 4-37). No alternative is predicted to improve conditions for woodland birds (figure 4-37).

The bushtit, ash-throated flycatcher, and sage thrasher are closely associated with juniper habitat. The bushtit is the only species that is predicted to change from a favorable outcome to a less favorable outcome under Alternatives 4 and 6 (figure 4-38). Restoration of native shrub-steppe is expected to reduce the availability of juniper woodland habitat in these alternatives.

Riparian-associated Birds. Current conditions and those expected under all the alternatives for this group of seven species were judged to have declined from historical conditions (figure 4-39). Species associated with riparian

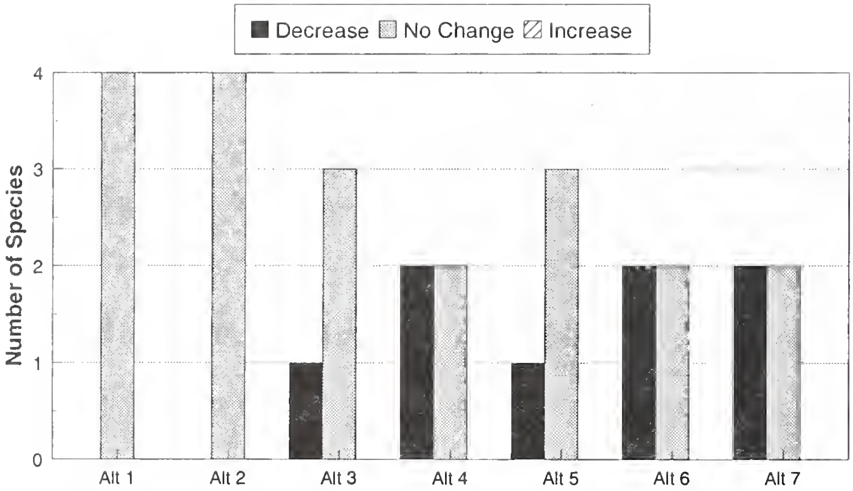


Figure 4-37. Woodland Birds, Change in Habitat from Current Conditions, 4 Species, UCRB Planning Area.

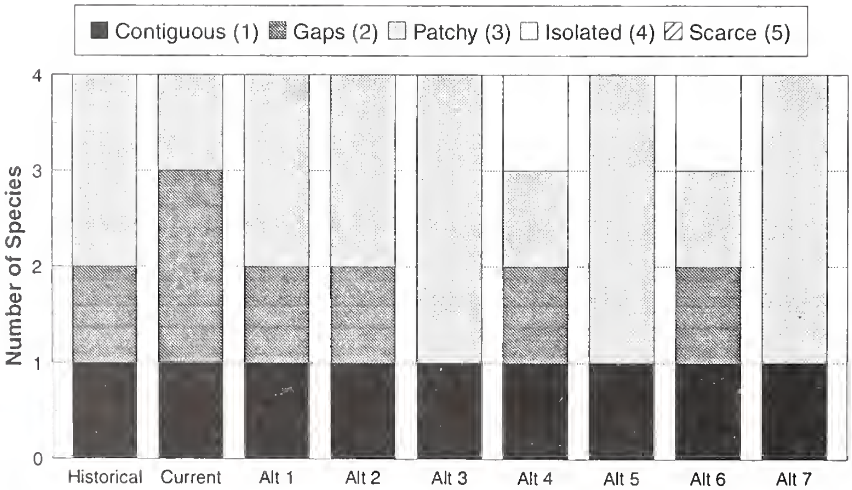


Figure 4-38. Woodland Birds, Weighted Mean Outcome Scores (1-5), 4 Species, UCRB Planning Area.

habitats had lower mean outcome scores than other species groups, reflecting the more patchy and disjunct distribution of riparian habitat compared with upland habitats. Habitat decline is primarily the result of increased human access and disturbance, fragmentation of habitat, reduced riparian acreage, and reduction in the quality of riparian habitats. With the exception of Alternative 5, all alternatives are projected to result in no change in status from current conditions for this group of species (figure 4-39).

Alternatives that would provide wider riparian buffers (Alternatives 2, 3, 4, 6, and 7) had higher average scores than alternatives with smaller buffers (Alternatives 1 and 5). For one species, the yellow-billed cuckoo, all alternatives rated as Outcome Class 5 (figure 4-40). Populations of yellow-billed cuckoo are currently extremely disjunct and limited in numbers of individuals. This species is closely associated with large cottonwood trees with dense shrubby understories. The yellow-billed cuckoo was given more than 50 points in Outcome Class 5 under Alternatives 1, 2, 3, 5, and 7, and 48 and 46 points in Outcome Class 5 under Alternatives 4 and 6 respectively. Fragmentation of habitat continues, and quality and quantity of habitat have decreased. The species also is predicted to be at risk from pesticide spraying on non-Federal lands.

Under a **cumulative effects** analysis, species associated with riparian habitats had less favorable outcomes than are typical for other species groups. This reflects continued loss of riparian habitat on non-Federal lands, as well as effects of pesticides, grazing, and loss of habitat on wintering grounds.

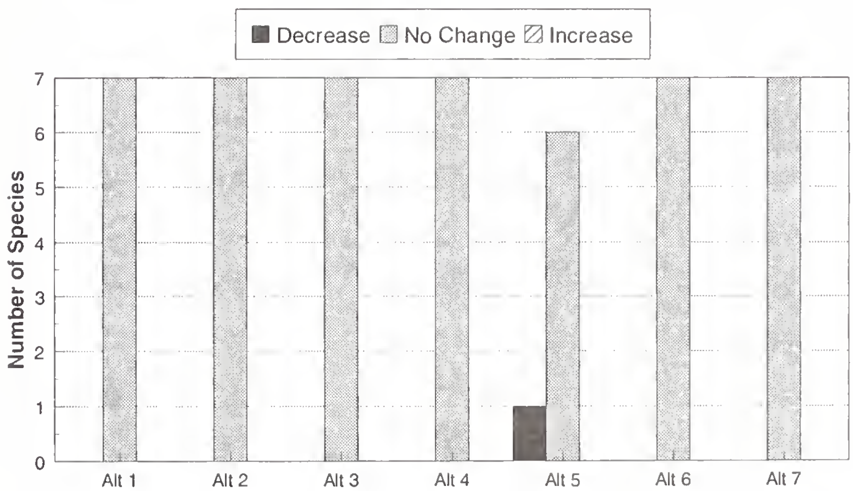


Figure 4-39. Riparian Birds, Change in Habitat from Current Conditions, 7 Species, UCRB Planning Area.

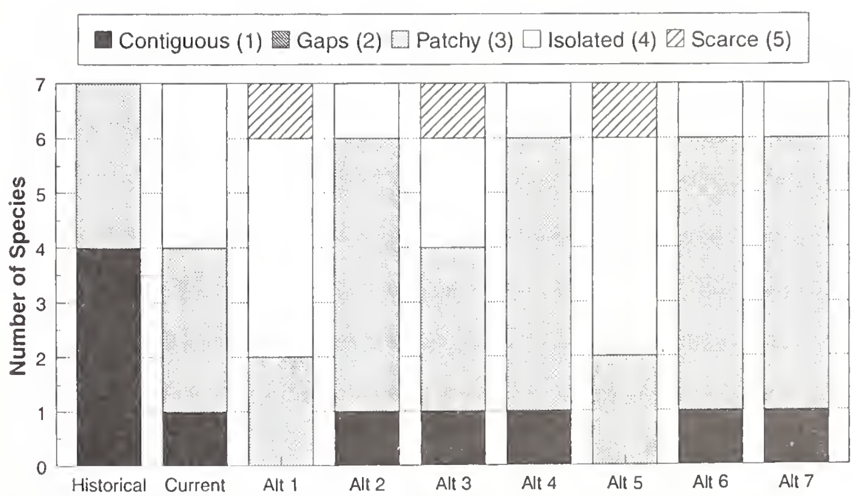


Figure 4-40. Riparian Birds, Weighted Mean Outcome Scores (1-5), 7 Species, UCRB Plannning Area.

Bats and Small Mammals

The scientific panels considered 11 species of bats and small mammals in the evaluation. Two other bat species were considered earlier but are not analyzed here. One, the western pipistrelle, was dropped from further consideration because it was judged that the alternatives would not influence its habitat, while the second species, Yuma myotis, was recommended for finer-scale analysis. Important habitat components for most bats are the following: large green trees and snags, particularly in clumps with understory intact; riparian buffers; downed logs; and protection of hibernacula. The combination of these components in sufficient amounts would generally produce the most favorable habitat for bats. Habitat for four species (fringed bat, hoary bat, long-legged bat, and western small-footed bat) that historically were broadly and patchily distributed, has been reduced to habitat that is isolated with strong limitations on interactions between populations.

Projected impacts on bats and small mammals vary widely across the alternatives (figures 4-41 and 4-42). All alternatives would result in a likelihood of extirpation for some species (figure 4-42). Alternatives 1 and 5 would result in the greatest reduction in habitat conditions for this group (figure 4-41). Alternatives 2 and 3 would result in minimal change from current conditions. Alternatives 4, 6, and 7 would result in a modest improvement in habitat conditions for bats and small mammals (figure 4-41).

Carnivores

Twenty-two species of carnivores exist in the project area. Six species of carnivores were selected for a detailed analysis: American marten, fisher, lynx, wolverine, gray wolf, and grizzly bear. This group includes several listed or candidate species (under the Endangered Species Act), all of which are listed as "sensitive" under Forest Service or BLM policy (see Appendix E). Additionally, three of these species (fisher, lynx, and American marten) are associated with late-seral successional stage forest structures.

The results of the analysis for this group are shown in figures 4-43 and 4-44. None of the alternatives would approach historical habitat conditions for these species. Generally the carnivore group would benefit from any alternative which prescribes reductions in road densities, thereby reducing the potential for contact with humans. Alternatives 1, 2, 3, and 5 would result in no change in status, compared to current conditions for all six carnivore species (figure 4-43). Within this set of alternatives, Alternatives 1 and 5 are predicted to have the lowest outcome score because of continued fragmentation of late-successional forest and a predicted lack of improvement in riparian conditions (figure 4-44). Conversely, Alternatives 4, 6, and 7 are predicted to improve habitat conditions for the six species in the carnivore group. As a group, the carnivores have less favorable outcomes scores compared to all other species groups considered in the analysis.

Declines of the fisher in the project area appear to be a result of heavy trapping and habitat deterioration. Fishers are found in a diversity of forest types but occur mostly in riparian habitats in landscapes dominated by mature and late-successional forests. Alternatives 4 and 6 are predicted to improve fisher habitat because of predicted improvements in both riparian conditions and distributions of late-successional forests.

American martens are closely associated with late-successional conifer forests with complex physical structure near the ground. Therefore, fragmentation of older forests reduces availability of suitable habitat. For this reason, Alternative 7 would provide the best marten habitat. Conversely, Alternatives 1 and 5 would have lower results due to continued fragmentation of late-successional forests.

Lynx are highly specialized predators closely associated with snowshoe hare populations. Exploitation for fur and deterioration of habitat conditions due to logging have been suggested as reasons for population declines and concern for continued persistence. Under Alternative 7, reserves are designated in portions of critical lynx range. The natural fire prescription in Alternative 7 would also benefit snowshoe hare populations. Alternatives 1, 2, and 5 would result in continued decline of lynx habitat, which may result in a non-recoverable bottleneck for lynx populations. Alternative 6 would restore habitats above current levels through management treatments designed to create better snowshoe hare habitat.

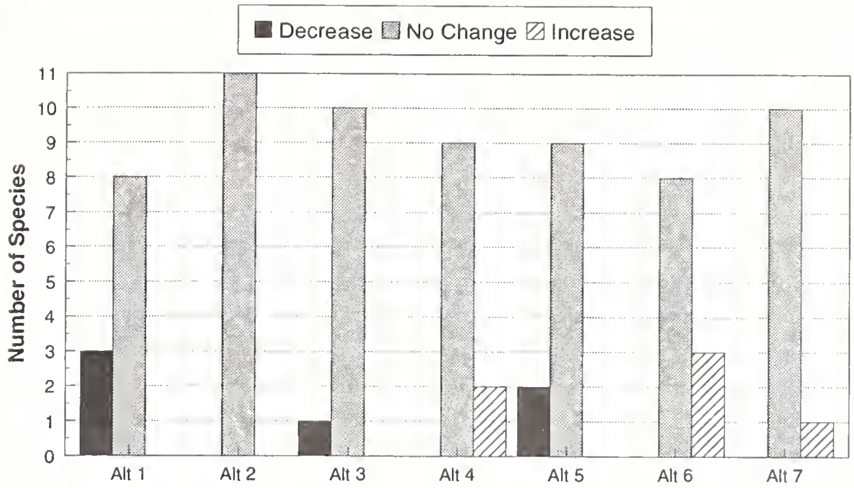


Figure 4-41. Bats and Small Mammals, Change in Habitat from Current Conditions, 8 Bat and 3 Mammal Species, UCRB Planning Area.

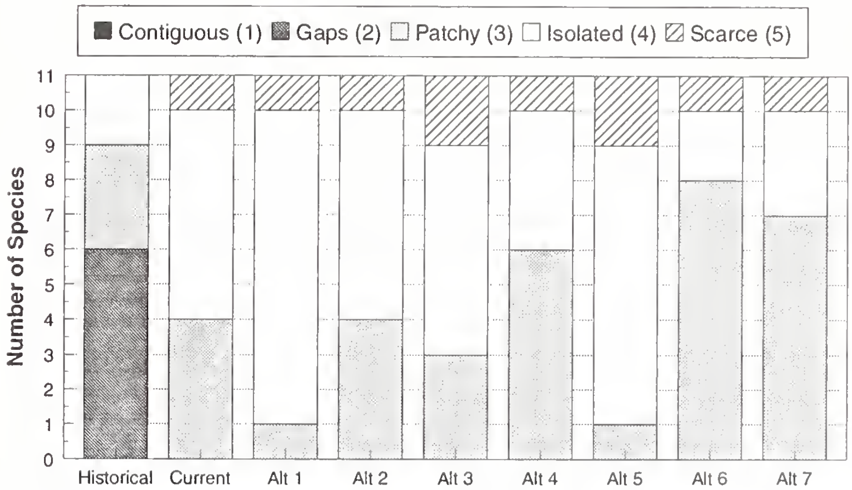


Figure 4-42. Bats and Small Mammals, Weighted Mean Outcome Scores (1-5), 8 Bat and 3 Mammal Species, UCRB Planning Area.

Wolverines were historically widespread in the project area; however current populations occur in low densities. Wolverines are scavengers and depend upon large predators and natural mortality for carrion. Refugia or large reserves that are capable of providing source populations combined with additional habitat suitable to support dispersing animals could provide the best strategy for wolverine conservation. Under Alternative 7, reserves protect roadless areas greater than 1,000 acres, and would provide the best wolverine habitat.

Gray wolves use a wide variety of habitats. Availability of prey and freedom from direct human- caused mortality are important considerations for the gray wolf. Outcomes for Alternatives 1, 3, and 5 are predicted to decline slightly, and Alternatives 2, 4, and 6 would result in no change to gray wolf habitat conditions.

Grizzly bears were listed as threatened under Endangered Species Act in 1975. A recovery plan was approved in 1982 then revised in 1993. Threats to grizzly bear persistence are related to human activities. Alternative 7 is the only alternative predicted to improve conditions for this species.

Ungulates

Twelve species of ungulates were considered in the analysis. Three of these (woodland caribou, California bighorn sheep, and pronghorn antelope) were selected for detailed analysis. The predicted effects are shown in figures 4-45 and 4-46.

Alternatives 3, 4, and 6 would result in no change for these species. The woodland caribou is the only species in this group that is

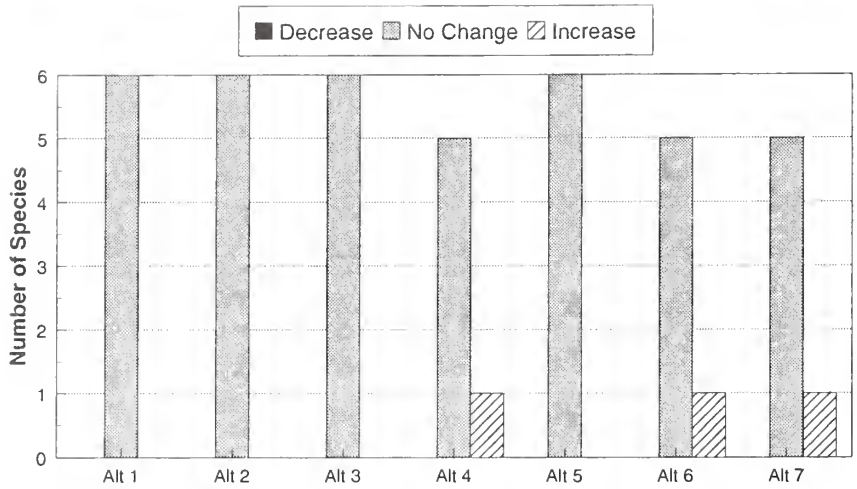


Figure 4-43. Carnivores, Change in Habitat from Current Conditions, 6 Species, UCRB Planning Area.

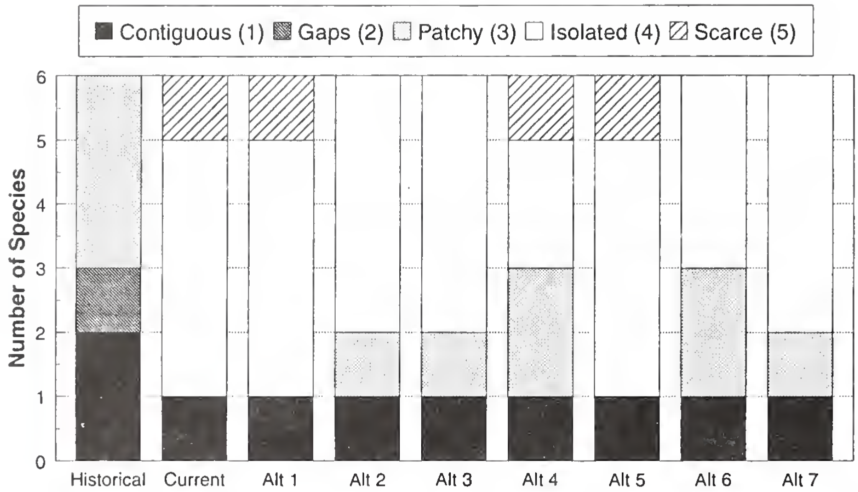


Figure 4-44. Carnivores, Weighted Mean Outcome Scores (1-5), 6 Species, UCRB Planning Area.

predicted to improve under Alternative 7. There is a continuing risk of extirpation for both woodland caribou and California bighorn sheep under all alternatives because their populations are small, isolated, and disjunct. Human developments are predicted to continue to increase in major river valleys resulting in further barriers for pronghorn antelope.

Threatened and Endangered Terrestrial Species

Threatened and endangered species occur in various habitats within the project area. This section displays the effects of alternatives on these species and their habitats within the UCRB planning area. The alternatives generally would have little effect on the viability of this group of species. Predicted effects differ by alternative and species.

The BLM and Forest Service requested information on threatened and endangered species from the U.S. Fish and Wildlife Service, which identified five species of animals and two plants as threatened or endangered in the UCRB planning area. For the purpose of this analysis the EIS Team assumed that Recovery Zones shown in approved recovery plans have the same management status as designated critical habitat.

The effects on threatened and endangered species described in the previous sections were based on the *Evaluation of Alternatives*. Under the Endangered Species Act, federal activities that may have an effect on threatened, endangered, or proposed species are subject to consultation with the U.S. Fish and Wildlife Service. Requirements for consultation would

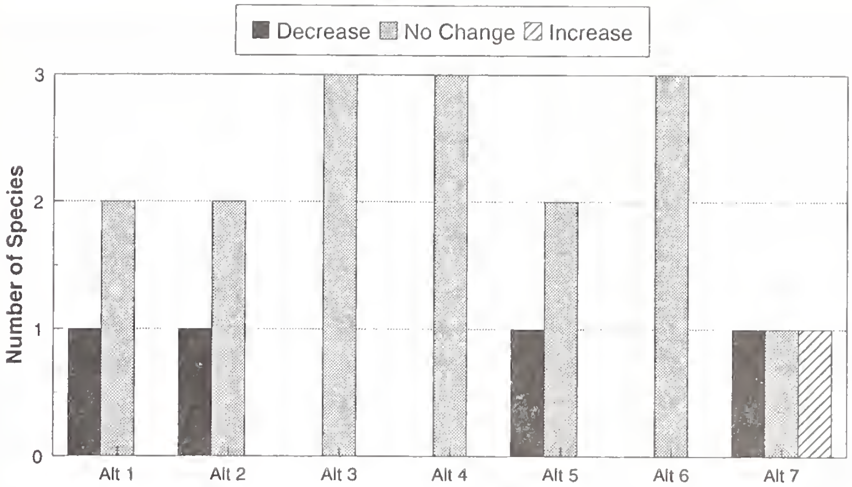


Figure 4-45. Ungulates, Change in Habitat Outcomes from Current Conditions, 3 Species, UCRB Planning Area.

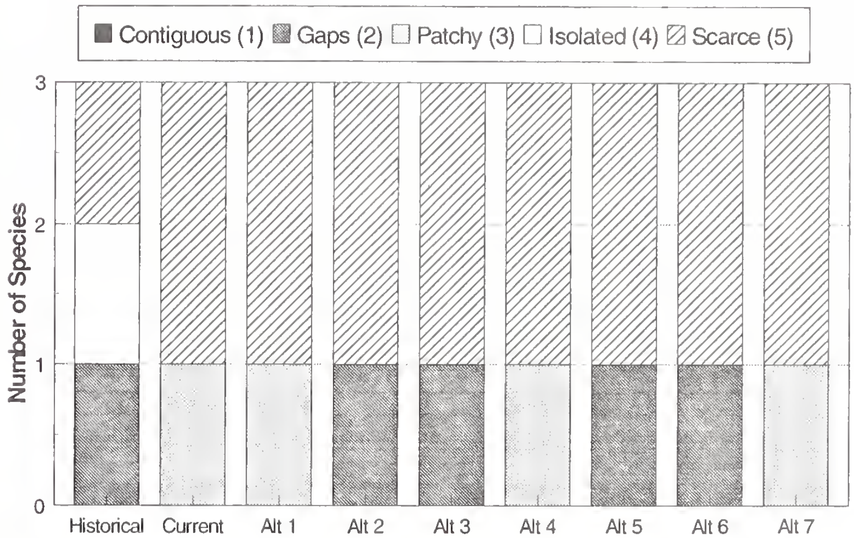


Figure 4-46. Ungulates, Weighted Mean Outcome Scores (1-5), 3 Species, UCRB Planning Area.

remain in effect under the selected alternative. If the selected alternative could have an effect on threatened, endangered, or proposed species, then biological assessment(s), appropriate for the scale of the decision, will be submitted to the U.S. Fish and Wildlife Service for consultation. Consultation will be completed prior to any ground-disturbing activities.

Plants

MacFarlane's four-o'clock (*Mirabilis macfarlanei*) is a threatened local endemic plant found only in the Snake River Canyon in Idaho and Oregon. Alternative 7 would result in some improvement compared to other alternatives, but the increase is limited. Competition from exotic plants is a concern in all alternatives (figure 4-47).

Water howellia (*Howellia aquatilis*) is a species of scattered distribution that occurs in highly specialized and restricted habitat of wetlands associated with glacial potholes and former river oxbows in Montana, Idaho, and Washington. The existence of specific riparian standards would contribute to protection of occupied habitats and the long-term persistence of this species regardless of the alternative.

Ute's lady tresses (*Spiranthes diluvialis*) is a threatened species recently discovered within the planning area along the Snake River. As there are standards in all the alternatives that require continued protection of Federally listed

species and the implementation of recovery plans, this species is not expected to decrease from current levels.

Wildlife

The grizzly bear (*Urusus arctos horribilis*) is generally located in five recovery zones within the basin. Critical habitat has not been designated for the grizzly bear by the U.S. Fish and Wildlife Service. The major potential effect on grizzly bears is human activities, rather than opposed to changes in vegetation composition and structure. Human access disturbs the bears_ normal movement patterns and may expose them to increased risk of mortality.

Alternative 7 is the only alternative predicted to significantly improve conditions for grizzly bear on Federal lands (figure 4-48). Establishment of reserves and retention of large unroaded areas would result in improved habitat needed and reduced contact with humans by bears.

The gray wolf (*Canis lupus*), uses a wide variety of habitats and is primarily dependent on an adequate prey base and areas where there is little human-caused mortality. Wolves occur in three management zones as outlined in the *Reintroduction of Gray Wolves to Yellowstone National Park and Central Idaho* (1994). Two of the areas contain experimental/"non-essential" populations. One area would be managed as a naturally recovering, fully endangered

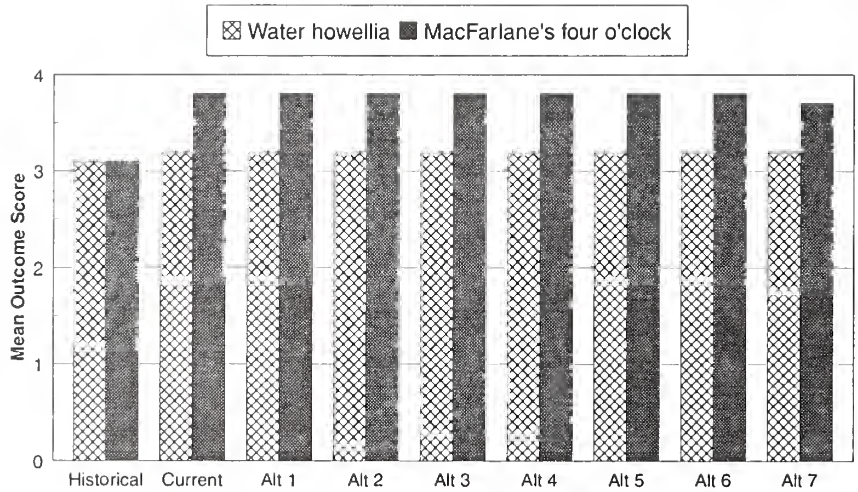


Figure 4--47. Threatened and Endangered Plant Species, Mean Outcome Score, UCRB Planning Area.

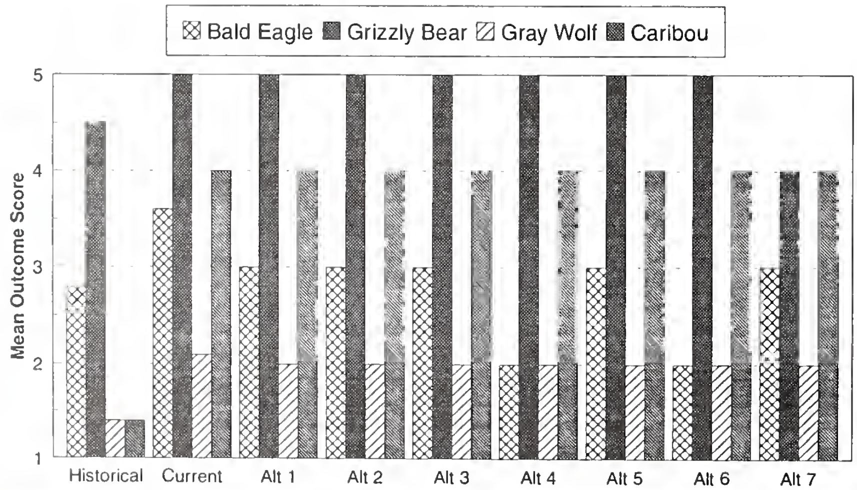


Figure 4-48. Threatened and Endangered Species, Mean Outcome Score, UCRB Planning Area.

population. Critical habitat has not been designated in any of these management zones by the U.S. Fish and Wildlife Service.

Outcome scores for wolves were predicted to be similar for all the alternatives (figure 4-48). The most improvement would occur under Alternative 7, although the improvement is limited. Wolves are habitat generalists; therefore, all alternatives would provide adequate vegetation conditions, including habitat for prey populations. Wolves are documented to avoid human contact and spend a disproportionate amount of time in remote areas, especially when raising young at den sites.

The woodland caribou's (*Rangifer tarandus caribou*) occupied habitat area overlaps with the Selkirk Grizzly Bear Recovery Area. Critical habitat has not been designated for woodland caribou by the U.S. Fish and Wildlife Service. All alternatives will have limited benefit to caribou because the population is extremely small and isolated (figure 4-48). Existing late successional habitat for caribou is limited in amount, distribution, and continuity, so any large fires, insect and disease outbreaks, and timber harvest have the potential to reduce existing woodland caribou habitat. Restoration of late-successional forest proposed in Alternatives 3, 4, and 6 would increase available habitat and improve existing conditions. Alternative 7 would result in some habitat restoration due to the overlap between occupied caribou range and late successional reserves (figure 4-48).

A recovery plan has been in effect for the bald eagle (*Haliaeetus leucocephalus*) since 1986, and has resulted in upward trends in both habitat and populations. These trends are expected to continue under all of the alternatives. None of the alternatives are expected to restore habitat or populations to historical conditions, but all alternatives would reduce the likelihood of population isolation and extirpation. Alternatives 4 and 6 would result in the greatest improvement compared to the other alternatives due to increased riparian emphasis, although the amount of improvement is predicted to be limited (figure 4-48).

The peregrine falcon (*Falco peregrinus*) occurs throughout the project area. The peregrine falcon was not included in the evaluation because there is no identified broad-scale habitat concern on BLM- or Forest Service-administered lands. Improving trends for the species are expected to continue under any alternative.

Cumulative Effects

Activities on non-Federal lands are predicted to negatively influence grizzly bear populations. Human developments are expected to continue to expand in large valleys, resulting in barriers to movement of bears and increased risk of bear mortality. Bear populations would likely become more isolated as human development increases.

Activities on non-Federal lands are predicted to negatively influence wolf populations. Actions that would result in very high road densities, high volume interstate highways, and residential development in large river valleys would contribute to these negative effects because of increased risk of mortality.

Effects of the alternatives for the woodland caribou would be no different when non-public lands are considered.

Alternatives 1, 2, and 7 would have less desirable viability outcomes for the bald eagle than Alternatives 4 and 6, but only to a minor degree. Loss of riparian habitat is predicted to continue on non-Federal lands. Alternatives would have similar outcomes as on BLM- or Forest Service-administered lands.

Habitat conditions would improve under all alternatives for water howellia because of the increased amount of private habitat that contains this species.

Habitat conditions would decrease under all alternatives for MacFarlane's four-o'clock, but the amount of decrease is minimal.

Cumulative Effects

The vast majority of the species analyzed in this evaluation would not have significant changes in viability status as a result of implementation of any of the action alternatives. This generally indicates that viability is more of a factor for most species at the fine and mid scales. However, when the outcomes of all species are viewed by alternative, differences among alternatives are more apparent. Compared in

this manner Alternative 1 is projected to have the highest number of species at risk; Alternatives 4, 6, and 7 have the lowest number of species at risk; and Alternatives 2, 3, and 5 are intermediate.

Threatened and Endangered Species

Habitat conditions for threatened and endangered species would not change significantly from current conditions. Existing recovery plans are assumed to be effective in maintaining or restoring populations. Many aspects of habitat for listed species are outside the control of Federal land managers; for example, road densities and human habitation are expected to continue to encroach on Federal land boundaries, and under any circumstance isolated populations would have little chance of improved interactions. Direct mortalities off Federal land are likely to continue, improvements in Federal highways are likely to continue to present barriers to recolonization of recovery areas, and social realities that affect implementation of recovery plans are likely to continue.

Mid-Seral Multi-Layer Forest

The high amounts of this forest type compared with historical range of variability and desired ranges of future conditions could have potentially profound effects on terrestrial wildlife and rare plant communities. Numerous pathways are possible, such as intense and frequent crown fires, conversion to late-successional multi-layer stands, and conversion to late-successional single layer stands. Predictions are that the amount of this vegetation type will remain high. This will have both positive and negative effects on different species.

Aquatic Priority Areas in Alternative 5

Terrestrial species associated with riparian habitats should benefit from the aquatic priority areas in Alternative 5. Aquatic priority areas are almost entirely located in higher elevation forested riparian habitats. Some of these species are: amphibians, waterbirds, passerine birds, cavity nesters such as the Williamson's sapsucker, and the fisher. Implementation of Fish 2000 (see Chapter 3) outside the aquatic priority areas in Alternative 5, is not anticipated to show the same level of benefit to terrestrial species as aquatic management priority areas, because of its more specific aquatic emphasis. The EIS Team believes that the less favorable outcomes for some terrestrial species were over estimated by the SIT in their evaluation of the effects of Alternative 5, especially those species that exist in aquatic priority areas.

Fire Occurrence and Habitat Stability in Alternative 7

Alternative 7 is similar to Alternatives 4 and 6 in having more improving outcome scores for species analyzed. The carnivore group would have more favorable outcomes in Alternative 7 because of establishment of reserves. Most of the species in this group are expected to benefit from Alternative 7 because of reduced roading and an anticipated decrease in human use. The reduction in human activities and associated mortality risks to species are more important than the vegetation pattern and characteristics that may be present within reserves. Other groups showing improving outcomes also would benefit from reduced human activities and are usually habitat generalists. Bird species more closely associated with specific vegetation characteristics and pattern may not benefit from Alternative 7 over the long term because vegetation patterns are unpredictable due to the potential extent of large crown fires.

Noxious Weeds and Exotic Plants

The extent and rapid rate of exotic plant invasion have implications for habitats used by terrestrial species. Many of the exotic plants reduce the quality and extent of many habitats. Many grasslands and shrubland habitats have been greatly reduced in extent because of conversion to agriculture in many locations. Terrestrial species are at increasing risk of reduction in habitat quality and quantity. Exotic plants also occur in forested lands, especially along disturbance corridors like roads and in openings like clearcuts. Exotics can reduce the quality and quantity of habitat, especially the dry forest types like interior ponderosa pine.

Known Bottlenecks, Fragmentation, and Corridors

Two types of habitat fragmentation occurs in the project area. The first type occurs among large blocks of Federally administered land, such as between mountain ranges. Examples of this type of fragmentation are the construction of large multi-lane highways, constructed or modified waterways such as reservoirs, and farming that results in the elimination or disruption of native vegetation. These types of activities create islands of habitat and reduce or eliminate interactions between islands for some species. In these cases, migration, population interactions, and recolonization may be disrupted. Maintaining connectivity is believed to enhance species richness and interactions of species between blocks of habitat.

The second type of fragmentation occurs within a block of vegetation: (1) when the size of the block decreases, (2) when the extent of the interior habitat is modified or reduced, or (3) when the shape of the same amount of area is changed to one in which the distance from the center to the closest edge has been reduced (such as a circular shape being converted to a linear shape). This type of fragmentation can disrupt species interactions within blocks of similar habitat. It may also allow different species to use the habitat and compete with or displace the original inhabitants.

Alternatives 4 and 6, which emphasize restoration, are predicted to be positive for improving connectivity and for increasing habitat block size with similar characteristics between and within stands of similar vegetation. Alternative 7, with a system of reserves, is projected to improve connectivity for areas of representative vegetation. Alternatives 1 and 5 would continue to increase fragmentation of similar habitats, and decrease block sizes of similar habitats because of traditional management. Alternative 2 is projected to improve connections among riparian habitats, but not uplands. Alternative 3 would be better than Alternative 2 because of anticipated improvements in both riparian and upland connectivity.

Effects of the Alternatives on Aquatics Aspects of the Ecosystem

This section presents the effects of alternatives on aquatic systems and aquatic species.

Aquatic Systems

Assumptions

The following major assumptions were made by the Science Integration Team during their evaluation of alternatives and subsequent review of changes to the alternatives.

- For Alternatives 3 through 7, assessments of road conditions and road-related risks (as specified in RM-S3), appropriate for the

Summary of Key Effects and Conclusions for Aquatic Systems

- Specific outcomes (such as water quantity, water quality, instream and riparian area habitat conditions) from the alternatives pertaining to lakes, streams, rivers, and riparian areas and wetlands were not predictable without site-specific NEPA analysis.

- In Alternatives 1 and 2, ecosystem management would not be emphasized, and there would not likely be watershed-scale consideration and protection of hydrologic and riparian area/wetland processes and functions. This would likely result in continued degradation of lakes, streams, and rivers.

- In Alternatives 3 through 7, ecosystem management would be emphasized, thus facilitating management for multiple ecological goals and long-term ecological sustainability on a landscape basis. Ecosystem management would provide a mechanism to effectively prioritize activities and weigh multiple risks to various resources. Furthermore, ecosystem management direction in Alternatives 3 through 7 would more readily foster implementation of adaptive management and analysis of cumulative effects than the approaches of Alternatives 1 and 2. It is expected that these features of Alternatives 3 through 7 would aid in overall improvement in lakes, streams, rivers, and riparian areas and wetlands.

- Alternative 4, with its higher activity levels, could pose greater short-term risks to aquatic ecosystems than would the slower activity rates and amounts of Alternative 6 and the restrictive and passive approach of Alternative 7, although lack of watershed and road restoration in Alternative 7 could pose greater risks to aquatic ecosystems in the long term.

- Watershed restoration levels would be greatest for Alternatives 4 and 6 and are expected to result in greater long- and short-term benefits to lakes, streams, rivers, riparian areas, and wetlands compared to other alternatives. However, greater uncertainty would be associated with Alternative 4, because requirements for Ecosystem Analysis at the Watershed Scale are less and therefore the context to reduce risk and maximize potential benefits from restoration actions may not be provided.

- In Alternatives 3 through 7, adjustment of standards supported by Ecosystem Analysis at the Watershed Scale in concert with broad-scale planning and subbasin review would likely meet the intent of ecosystem management and integration of landscape, terrestrial, aquatic, and social objectives. Alternatives 4, 5, and 6 would offer more flexibility than Alternative 7 with respect to activities permitted in riparian areas and wetlands. Alternative 6 would provide the most management options because site-specific NEPA analysis could be used in some areas for up to four years to adjust ICBEMP standards. This adjustment process would maximize opportunities for adaptive management. Since less hierarchial analysis would be required in Alternative 4, implementation of restoration actions would occur faster than in other alternatives. However, uncertainty of meeting the intent of ecosystem management and integration of objectives would be greater than Alternative 6 because of the lack of incentive to modify and integrate objectives and standards that fit watershed-scale processes and functions. There would also be risks associated with the lack of active landscape and watershed restoration in Alternative 7, especially in the long term.

- Alternatives 2 through 7 would adequately protect ecological functions within riparian areas and wetlands except for the timber priority areas of Alternative 5. Within timber priority areas of Alternative 5, the size of the riparian conservation areas would not likely be adequate to fully protect aquatic resources, primarily because of their limited widths and lack of protection for intermittent streams. Within livestock priority areas of Alternative 5 (including large parts of the Northern Great Basin, Columbia Plateau, and Owyhee Uplands ERUs), priority areas for protection of riparian areas would not be established. Even so, to meet proper functioning condition objectives within timber and livestock priority areas, degradation of riparian areas would cease and some restoration would begin.

- Alternative 1 would have no consistent planning-area-wide direction for riparian area protection and is predicted to not adequately protect riparian functions.

Summary of Key Effects and Conclusions for Aquatic Species

- The current composition, distribution, and status of most native fish species within the planning area would remain stable under Alternative 2 and remain stable or improve under Alternatives 3, 6, and 7. The greatest potential for improvement occurs with Alternatives 6 and 7. Alternative 4 has similar potential to benefit native species as Alternatives 6 and 7, but uncertainty in the ability to prioritize management actions and evaluate risks, coupled with high levels of activities, decreases confidence in successful ecological outcomes. Improvements in distribution and status are linked to levels of watershed and riparian restoration and other management activities within the species' current range. Most native fishes' distribution and status would continue to decline under Alternatives 1 and 5 inside timber and livestock priority areas due to inconsistent and inadequate riparian and aquatic protection measures in all or part of species' current ranges.

- Benefits of any alternative are linked to improved instream and riparian conditions resulting from better riparian management, higher levels of watershed and riparian restoration, and Ecosystem Analysis at the Watershed Scale. Successful ecological outcomes from Alternatives 4 and 6 depend on efficient prioritization of restoration actions and maximizing adaptive management to minimize risk. Alternative 7 could pose risks to isolated and fragmented populations because of the lack of active forest, rangeland, and watershed restoration, raising uncertainty about long-term improvements in the more depressed and fragmented portions of species' ranges.

- Alternatives 1, 2, and 5 would result in the continued decline in the overall status and distribution of steelhead and stream-type chinook salmon stocks due to a minimal emphasis on restoration and continued land disturbance in portions of the current range over the long term. None of the alternatives address the need for a comprehensive approach to alleviate mortality outside BLM- or Forest Service-administered lands to ensure persistence and viability of steelhead or stream-type chinook salmon stocks.

- Downstream stresses associated with the hydropower system are one of the major causes of declining Snake River anadromous fish populations (NPPC 1986; NMFS 1992). Federal efforts are underway to address these problems through increased spill, barging, and monitoring. Mid-Columbia anadromous stocks (for example, John Day and Deschutes Rivers) are influenced less by hydropower due to a lower number of dams below spawning and rearing areas. Maintenance of high-quality habitats is vital to the persistence of populations, but the magnitude of effects varies from subbasin to subbasin. In general, it remains important to restore degraded watersheds where habitat is most limiting to fish, to improve egg-to-smolt survival over current conditions. High-quality habitat alone, however, is no guarantee of increased persistence without a comprehensive approach that addresses all mortality factors. Additional high quality habitat alone could increase abundance of individual fish, but it would not likely reverse current negative population trends in the short-term. Salmon population numbers in much of the interior Columbia Basin are far below what current habitat conditions could likely support under a scenario of increased downriver survival.

- None of the alternatives would be expected to measurably affect the habitat needs of ocean-type chinook salmon because they inhabit lower-elevation mainstem river habitats that are less responsive to Federal land management. Alternatives 6 and 7 have the most conservative approach and might result in some benefit to ocean-type chinook salmon if management actions improve water quality and quantity. None of the alternatives address the need for a comprehensive approach to alleviate mortality outside BLM- or Forest Service-administered lands to ensure persistence and viability of ocean-type chinook salmon stocks.

scale, will be completed prior to or in concert with subbasin review and Ecosystem Analysis at the Watershed Scale to support modification of access and travel management plans (as specified in RM-S4) and watershed restoration.

- For Alternatives 3 through 7 where ecosystem analysis, site-specific NEPA analysis, and associated planning documents result in changes to Riparian Conservation Areas (RCAs) delineation, or changes in applicable standards for actions within RCAs, such changes would not degrade aquatic and riparian resources or impede restoration.

- Proper functioning condition (PFC) achieves hydrologic function first; land managers' decision space is between this level and attainment of site-specific vegetation potential. For purposes of aquatic and terrestrial communities, conservation and restoration of riparian areas includes managing towards advanced successional stage of native riparian vegetation consistent with the ecological capability for the site. Determination of proper functioning condition is an interdisciplinary team process.

- Effects on aquatic ecosystems and communities on non-Federal lands would be limited to indirect effects, primarily from improved water quality downstream of BLM-

or Forest Service-administered lands. Thus, many non-Federal areas are expected to remain degraded, or possibly decline further.

- ◆Watershed restoration can benefit aquatic resources, but risk is inherent in all management and restoration actions. High restoration alternatives (Alternatives 4 and 6) would be pursued with an approach that maximizes learning while minimizing risks (that is, adaptive management). Restoration activities would be prioritized by sub-basin review and Ecosystem Analysis at the Watershed Scale, and restoration would focus on first securing strongholds and currently productive habitats at risk. Both Alternatives 4 and 6 use the subbasin scale for prioritization, but Alternative 6 would rely much more on the watershed scale for prioritization.

- ◆In Alternatives 4, 5, and 6, active management of riparian areas could be used to reduce severity of fire, where appropriate, by re-creating a more natural mosaic of stands in different conditions that offer natural firebreaks and less concentrated food sources for forest insect pests. The large tree standards (AQ-S6, AQ-S7, AQ-S8) take precedence over fire regime and severity direction within riparian areas.

  Discussion: This assumption does not imply that all riparian areas need active management to reduce severity of uncharacteristic fire. However, the EIS Team recognized that active management may be needed in some situations and therefore did not preclude this option at the broad-scale planning level. In addition, the EIS Team assumed that if active management occurred within riparian areas where large trees were lacking, retention of large trees of any species would occur to maintain aquatic and riparian functions and processes as described in standards AQ-S6 through AQ-S8 and associated rationale. Objective AQ-O1 addresses the intent of riparian area management.

- ◆Declines in status and occurrence would occur for some species regardless of future land management activities.

  Discussion: Risks for fishes would be associated with future land management activities that change habitats, as well as with past management and the current condition of habitats and landscapes. The effects of land disturbance in watersheds may not be evident in streams for years afterward. Catastrophic events that either precipitate such changes or directly influence mortalities of some species are likely rare and largely unpredictable. Land management effects in aquatic environments may be evident for some time after land management activities have stopped. Populations that are stable, but small are also vulnerable to chance environmental events. Even populations isolated in high quality habitats are vulnerable to permanent extinction through time. Some species are likely to experience further local extinctions even without any further habitat losses because of past disturbances that resulted in fragmentation and isolation of habitats.

- ◆The key salmonids are useful indicators of the integrity and status of aquatic ecosystems in general. Activities that effectively manage risks and restore healthy and diverse populations and habitats for salmonids would benefit other species in similar ways.

- ◆Species that are listed and proposed for listing at the time of the evaluation are assumed to be listed at the time of implementation. This assumes that no currently listed species would be delisted prior to implementation, and also that a species currently proposed for listing would be listed at the time of implementation.

- ◆Ecosystem Analysis at the Watershed Scale, which might lead to changes in riparian protection widths and standards, would be more effective in conserving and restoring watershed and riparian processes relevant to the maintenance of healthy aquatic ecosystems than default riparian protection widths.

- ◆Trends in resident species such as bull trout, westslope cutthroat trout and redband trout are reasonable indicators of spawning and rearing conditions for stream-type chinook salmon and steelhead that share the same freshwater habitats.

Causes of the Effects of Each Alternative on Aquatic Ecosystems

The effects on aquatic ecosystems were determined from anticipated outcomes resulting from implementation of the seven alternatives described in Chapter 3, given the assumptions described previously. Each alternative prescribes a different level of protection, maintenance, and restoration of aquatic and riparian resources. When combined with the degree, rate, and method of land management activities, effects on aquatic and riparian resources can be qualitatively and quantitatively described for each alternative. The following list describes factors which substantively differ among alternatives, and thus causing different effects on aquatic ecosystems within areas administered by the Forest Service or the BLM.

- ◆The prescribed level of protection and restoration of watershed and riparian functions and processes.
- ◆The quantity and scale of ecosystem analysis.
- ◆The rate, spatial extent, and prioritization of management activities.
- ◆Conservation and protection activities directed at key salmonid strongholds and fringe populations, at-risk fish populations and habitats, and narrow endemic and sensitive fish species.

Methodology: How Effects on Aquatic Systems were Estimated by the Science Integration Team

A brief summary of the evaluation procedure is given here; for a more detailed description of the evaluation methods, see the *Evaluation of Alternatives* (Quigley, Lee, and Arbelbide 1997). The evaluation was conducted on the basis of interpretation of both quantitative and qualitative information collected solely for the purpose of alternative evaluation, and on the basis of information generated as part of the *Scientific Assessment* of the project area (Quigley, Graham, and Haynes 1996; Quigley and Arbelbide 1996). Participants in the evaluation included Forest Service and BLM scientists from the SIT and additional invited scientists from the Forest Service, U.S. Environmental Protection Agency, National Marine Fisheries Service, and U.S. Fish and Wildlife Service. The evaluation of effects consisted of three steps, each of which built on the preceding step:

Qualitative Evaluation of the Overall Level of Protection, Maintenance, or Restoration of Aquatic and Riparian Habitats

The first step of the evaluation addressed overall effects on hydrology, watershed processes, and aquatic, riparian and wetland processes and function. This component of alternative evaluation was based primarily on proposed activity levels (including harvest, precommercial thinning, decreases in road density, watershed restoration, prescribed fire, livestock management, improved rangelands, and riparian restoration), riparian area management, and ecosystem analysis requirements, which provide the mechanism and ability to prioritize activities from a holistic ecosystem perspective. These combined factors were used to assess the overall level of risk to aquatic and riparian environments.

Quantitative and Qualitative Evaluation of Expected Changes in the Distribution and Status of Key Salmonid Species

The second step includes assessment of expected trends in distribution and status for bull trout, redband trout, westslope and Yellowstone cutthroat trout, ocean-type and stream-type chinook salmon, and steelhead. As discussed in the *Scientific Assessment* (Quigley, Graham, and Haynes 1996; Quigley and Arbelbide 1996), these species are viewed as important broad-scale indicators of aquatic integrity throughout the project area. The large amount of existing population information for these species allows general analysis of population changes in response to land management. The qualitative component of this part of the alternative evaluation was based on consideration on the level of overall protection of aquatic systems as defined in step one above, and the spatial distribution of special emphases defined in the alternatives regarding protection and restoration of aquatic ecosystems, including core and fringe areas of the seven individual species.

The quantitative component of this aspect of alternative evaluation was aimed at predicting expected distribution and status outcomes of key salmonid species on BLM- or Forest Service-administered lands 100 years after alternative implementation. The basis for quantitative analysis was the activity tables and rule sets specified in Chapter 3 (tables 3-6, 3-7, 3-10, 3-11, 3-12) derived from projected forest and range management activities that are known to influence aquatic habitats. These activities (and associated activity tables) vary in intensity by alternative, and vary spatially within and among alternatives by forest and range clusters. The spatial allocation of management activities derived from the activity tables was associated with the distribution of key salmonids to indicate the potential influence of management activities. These activity tables and rule sets were further used to predict outcomes in fish distribution and status through predictions of future road density patterns and statistical models relating current patterns of fish distribution and road density. It was assumed in this analysis that future distributions of fish would be influenced by future road density patterns in a manner similar to the present correlations. In this analysis, road density was assumed to be a proxy for many management-related landscape effects for which there are no direct measures or projections. Changes in distribution and status outcomes were a possible indication of modifications in habitat condition.

The SIT judgement in overall trends in species distribution and status was based on quantitative model outcomes, an interpretation of risks associated with intensity and allocation of management activities, and the degree of aquatic and riparian protection.

Evaluation of Narrowly Distributed Endemic or Sensitive Taxa

The third step involved evaluation of 18 narrowly distributed endemic or sensitive taxa that are sensitive to Federal land management practices and occur in more than one National Forest or BLM District. Similar to key salmonids, spatial allocation of management activities derived from the activity tables (tables 3-6 and 3-7) was associated with the reported distribution of narrow endemic and sensitive species to indicate the potential influence of management activities. This information was used in combination with the level of riparian and aquatic protection, known biological requirements of the species, and professional judgement, to evaluate the effects on individual or groups of narrow endemic or sensitive species habitats.

EIS Team Application of SIT Information

The SIT addressed habitat outcomes and population outcomes. The EIS Team used the SIT information as a basis to further evaluate alternatives and to infer whether habitat would support viable populations of fish. Rationale presented in Appendix K was also used to support viability determinations.

* Changes in population distribution and status of key salmonids and changes in habitat for narrowly distributed, endemic, or sensitive fish species were used to address the viability requirements of the National Forest Management Act (NFMA) planning regulation 36 CFR 219.19. These methods are reasonable for addressing NFMA viability requirements for broad-scale programmatic planning.

* Cumulative effects analysis, under NEPA requirements, was used to make inferences about change in populations, population persistence, and habitat on non-Federal and Federal lands.

Effects of the Alternatives on Aquatic Systems

Alternatives 1 through 7 were evaluated relative to: (1) anticipated effectiveness in maintaining and protecting aquatic ecosystem function, structure, and processes; and (2) their expected effects on the distribution and population abundance of 25 native fish species and subspecies. The effects of the alternatives on aquatic ecosystems were evaluated by the Science Integration Team (SIT) and are reported in the *Evaluation of Alternatives* (Quigley, Lee, and Arbelbide 1997). The EIS Team, in consultation with the SIT, further evaluated the alternatives on the basis of the SIT evaluation.

Effects on Hydrology, Watershed Processes, and Riparian Areas and Wetlands

Overall effects of the alternatives on hydrology, watershed processes, and riparian areas and wetlands were qualitatively assessed from consideration of the alternatives with respect to the following: (1) the overall intent and activities associated with the alternative; (2) the roles and requirements associated with finer-scale analysis processes; (3) protection of riparian areas and wetlands through designation of Riparian Conservation Areas (RCAs), and the specific direction for activities within these areas; (4) distribution and treatment of areas designated for aquatic resource emphasis; and (5) the role and application of Riparian Management Objectives (RMOs). An assumption of this analysis is that desirable outcomes with respect to water quantity, water quality, stream channel processes and conditions, and the overall integrity of aquatic and riparian resources would coincide with the level of overall protection of watershed and riparian processes and conditions identified in this component of the alternative evaluation. However, specific and quantitative predictions of outcomes for many aquatic and riparian attributes were not possible at this scale.

Overall Intent of the Alternatives

In Alternatives 1 and 2, ecosystem management would not be emphasized at the broad and mid scale, and therefore would have no comprehensive strategy for addressing ecosystem interactions. Alternative 1 would have no mechanism for watershed-scale ecosystem management and would provide little consideration of watershed-scale processes and functions. Alternative 2, continuation of PACFISH/INFISH direction, would focus protection on riparian corridors and begin restoration of aquatic and riparian systems. In Alternatives 3 through 7, aquatic and riparian systems would be blended with watershed and upland processes at the broad and mid scale as a result of the ecosystem management emphasis defined by the objectives and standards. This emphasis could facilitate management for multiple ecological goals and long-term sustainability on a landscape basis. Furthermore, ecosystem management, as intended for Alternatives 3 through 7, would more readily foster implementation of adaptive management and analysis of cumulative effects than the approaches of Alternatives 1 and 2. Alternative 4, with its higher activity levels, could pose greater short-term risks to aquatic ecosystems than would the slower activity rates and amounts of Alternative 6 or the more restrictive and passive approach of Alternative 7. Watershed restoration levels would be greatest for Alternatives 4 and 6, with consequent benefits to aquatic ecosystems.

The effect of the levels of watershed restoration activities would also correlate to the time required for water quality improvements for water bodies currently listed as water quality limited under Section 303(d) of the Clean Water Act. More active restoration activities could shorten the time for compliance, while passive restoration strategies such as in Alternative 7, may lead to an extended time period where water bodies continue to be water quality limited. However, the rate and effectiveness of restoration of water quality would be dependent upon competing priorities and overlap with areas requiring ecosystem analysis. The flexibility to prioritize restoration would be limited in alternatives having higher amounts of

prescribed Ecosystem Analysis at the Watershed Scale, especially where these prescribed areas do not overlap with 303(d) listed water bodies. Coordination of active restoration activities would lessen reliance on appropriated funds and accelerate improvements in water quality.

In Alternative 7, the ≥1,000-acre unroaded areas would be managed similarly to the large reserves; activities would be limited. Lack of forest, rangeland, and watershed restoration in Alternative 7 would pose risks that may outweigh the benefits of the alternative's restrictive approach; the legacy of historical management activities may place some ecosystems at risk without active restoration. These risks would likely be most important in the more fragmented portions of watersheds (see Effects on Aquatic Species), and would likely increase where watersheds have high sensitivity and high percentages of roaded area.

Application and Role of Ecosystem Analysis

The role of ecosystem analysis is to increase the likelihood of ecologically appropriate outcomes in two ways: (1) by providing a context for management actions that are within the capabilities and limitations of a specific watershed, and (2) as an effective mechanism for prioritizing actions and weighing multiple risks to specific resources within the ecosystem. Although ecosystem analysis can be accomplished at multiple scales, the subbasin and watershed scales have been determined to be especially important to reduce risks to aquatic and riparian systems. Subbasin review, a validation and prioritization process, is required in Alternatives 3 through 7.

There are no requirements for ecosystem analysis in Alternative 1 (figure 4-49). In Alternative 2, although Ecosystem Analysis at the Watershed Scale is intended to provide consideration of watershed-scale processes and functions, site-specific NEPA analysis could be used to adjust RCA boundaries and Riparian Management Objectives (RMOs) values without the watershed-scale context. In Alternatives 3 through 7, it is intended that ecosystem analysis at multiple scales would be conducted to facilitate understanding of ecosystems and ecosystem processes, and would provide a basis for efficient and effective prioritization of management actions. In Alternatives 3, 4, 5 (outside timber and livestock priority areas), and 7, RCA boundaries and RMO values may only be adjusted after conducting Ecosystem Analysis at the Watershed Scale. In Alternative 6, adjustment of RCA boundaries and RMO values would require completion of Ecosystem Analysis at the Watershed Scale on most BLM- or Forest Service-administered lands.

On the remaining BLM or Forest Service land area of Alternative 6, site-specific NEPA analysis could be used to adjust RCA boundaries and RMO values during a four year transition period, if such action would provide equal or greater achievement of ICBEMP objectives. After the transition period, modifications would only be made after conducting Ecosystem Analysis at the Watershed Scale. It is assumed that full use of ecosystem analysis would benefit aquatic ecosystems more than the limited role specified in Alternatives 1 and 2. The potential amount of Ecosystem Analysis at the Watershed Scale varies among Alternatives 1 through 7 (figure 4-49). Alternative 6 would potentially have the greatest amount of ecosystem analysis followed by Alternatives, 3, 4, 5, and 7. Consequently, implementation of Ecosystem Analysis at the Watershed Scale as specified in Alternatives 3 through 7 is expected to benefit aquatic systems more than under Alternatives 1 and 2.

However, the lack of specificity regarding (1) ecological outcomes required of finer-scale planning processes, and (2) connections between planning processes results in some uncertainty in outcomes, especially for Alternatives 3 through 6. Ecosystem Analysis requirements for Alternative 5 are similar to those of Alternatives 4 and 6, except within timber priority areas, where watershed-scale or site-specific analysis of hydrologic and geomorphic functions are required, and within livestock emphasis areas, where the only analysis requirement is that necessary for evaluating attainment of proper functioning condition. In Alternative 7, peer-reviewed Ecosystem Analysis at the Watershed Scale would be required before many management activities in RCAs.

No alternative gives clear direction regarding trade-offs between fire risk and risk to aquatic resources. Research in this area is limited, and

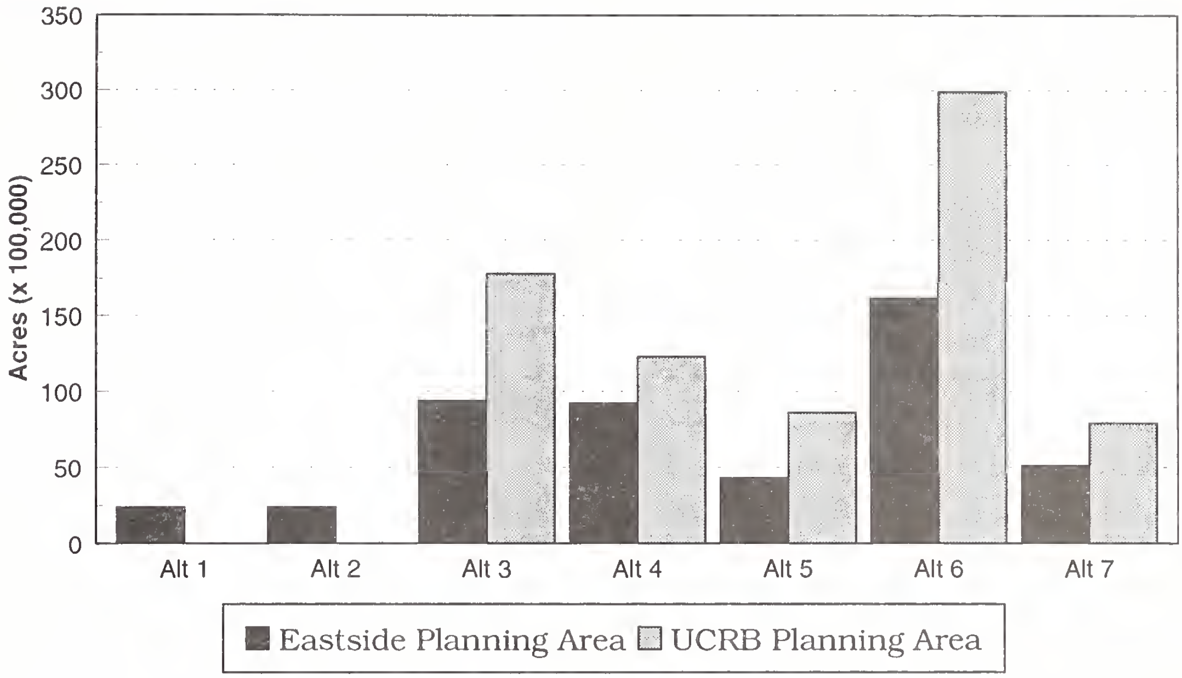


Figure 4-49. Potential Acres of Ecosystem Analysis at the Watershed Scale, UCRB and Eastside Plannint Areas.

This figure shows the number of acres of Forest Service- and BLM-administered land where ecosystem analysis is potentially required before conducting management actions. Acreage values for threatened, endangered, and proposed terrestrial species are not included for Alternatives 3 through 7. Also, acres of large blocks of native rangeland are not displayed for Alternative 6.

All acreage values were determined from 1 kilometer (250 acres) resolution data. The acreage values do not reflect ecosystem analysis requirements due to certain actions within or conditions of Riparian Conservation Areas outside the designated watersheds summarized in this graph.

Abbreviations: EEIS = Eastside EIS planning area
UCRB = UCRB EIS planning area

opinions vary on where the greater risk lies: risk from uncharacteristic fire, or risk from activities to reduce uncharacteristic fire. Wildfire is not viewed as a particular threat to healthy aquatic systems, but depressed and strongly isolated populations could be vulnerable to the effects of intense or large fires. Present aquatic species have evolved in response to and in concordance with fire (Gresswell, draft). Besides the mechanisms through which fish populations respond to wildfire described in the Effects to Aquatic Species section, mechanisms that affect watershed response following fire, such as the occurrence of high intensity storms and delivery of sediment to a stream network, are important in determining outcomes, and are highly variable. Usually watershed effects from wildfire are short term and may be offset by compensating watershed responses; for example, where riparian vegetation is burned and shade is reduced, increased streamflow

heating may be offset by increases in cooler water from subsurface flow and loss of evapotranspiration. Although fuel loading may be high in some riparian areas, they are generally more moist and have different disturbance patterns, intensities, and intervals than the upslopes. Nevertheless, watershed effects from fire can be substantial, and may have long-lasting effects. Studies have shown that the most prominent effect at the watershed scale may be increases in water yield (Gresswell, draft). Some areas present higher risk than others. The interface between roaded and unroaded areas is an area where uncertainty of outcome is high. Other areas of uncertainty of outcome include highly erosive landscapes and smaller confined streams, and headwater areas where riparian vegetation is similar to upland vegetation conditions that are highly susceptible to fire.

Riparian Conservation Areas (RCAs) and Activities Permitted Within

All alternatives have goals, objectives, and standards pertaining to protection of riparian areas and wetlands. The extent of the areas given riparian consideration and emphasis varies by alternative (figure 4-50). On the basis of the objectives, the width of riparian areas, and the permitted activities within them, Alternatives 2 through 7 would adequately protect ecological functions within riparian areas and wetlands. This is because conservatively managed riparian areas of one site-potential tree height or the floodprone width are considered adequate to maintain most key aquatic and riparian functions.

An exception would be the commodity priority areas of Alternative 5. Within timber priority areas (including large parts of the Northern Glaciated Mountains and Lower Clark Fork ERUs), riparian process and function would not likely be adequately protected, primarily because of the limited widths and lack of protection for intermittent streams. Within livestock priority areas of Alternative 5 (including large parts of the Northern Great Basin, Columbia Plateau, and Owyhee Uplands ERUs), special priority areas for protection of riparian areas would not be established, although the direction for obtaining and moving beyond proper functioning condition is intended to protect, maintain, and restore aquatic and riparian function and process.

There are differences among the alternatives in terms of the actual standards for managing RCAs. Under Alternative 1, there would be no consistent area-wide planning direction for riparian area protection. Standards for activities within RCAs in Alternatives 2, 3, 4, 5 (outside of timber and livestock priority areas), 6, and 7 would likely protect most ecological functions within riparian areas, but there are differences among the alternatives that could affect local risks to aquatic ecosystems. The standards for activities in riparian areas under Alternative 2 cannot be adjusted on the basis of subsequent analysis; therefore, there would be little short-term risk to aquatic ecosystems from management actions with RCAs. Management disturbance of riparian and wetland ecological processes under Alternative 7 would be less than all other alternatives because of conservative direction for activities within riparian areas. In Alternatives 2 and 7, long-term risks could increase because of less flexibility to address other ecological issues such as forestland and rangeland health, thus potentially setting the stage for uncharacteristic ecological disturbances that could adversely affect aquatic ecosystems. Because of similarity among riparian management standards for Alternatives 3, 4, 5 (outside of timber and livestock priority areas), and 6, there would be little expected difference among these alternatives in terms of risks to aquatic and riparian resources within RCAs. Alternatives 4 and 6 provide direction for side slopes adjacent to riparian areas which would reduce risks to riparian areas as compared to Alternatives 2, 3, and 7.

Alternatives 3, 4, 5 (outside of timber and livestock priority areas), 6, and 7 promote Ecosystem Analysis at the Watershed Scale, which would allow for modification of standards. This would benefit aquatic ecosystems in the long term through implementation of integrated ecosystem management and standards that are watershed- and landscape-specific. Riparian delineation under Alternative 4, 5 (outside of timber and livestock priority areas), and 6 is based on a zone concept that uses site-potential tree heights and slope based sediment travel distances to establish RCAs in forested landscapes. This would facilitate integration of ICBEMP direction more readily than the other alternatives because it accounts for direct and

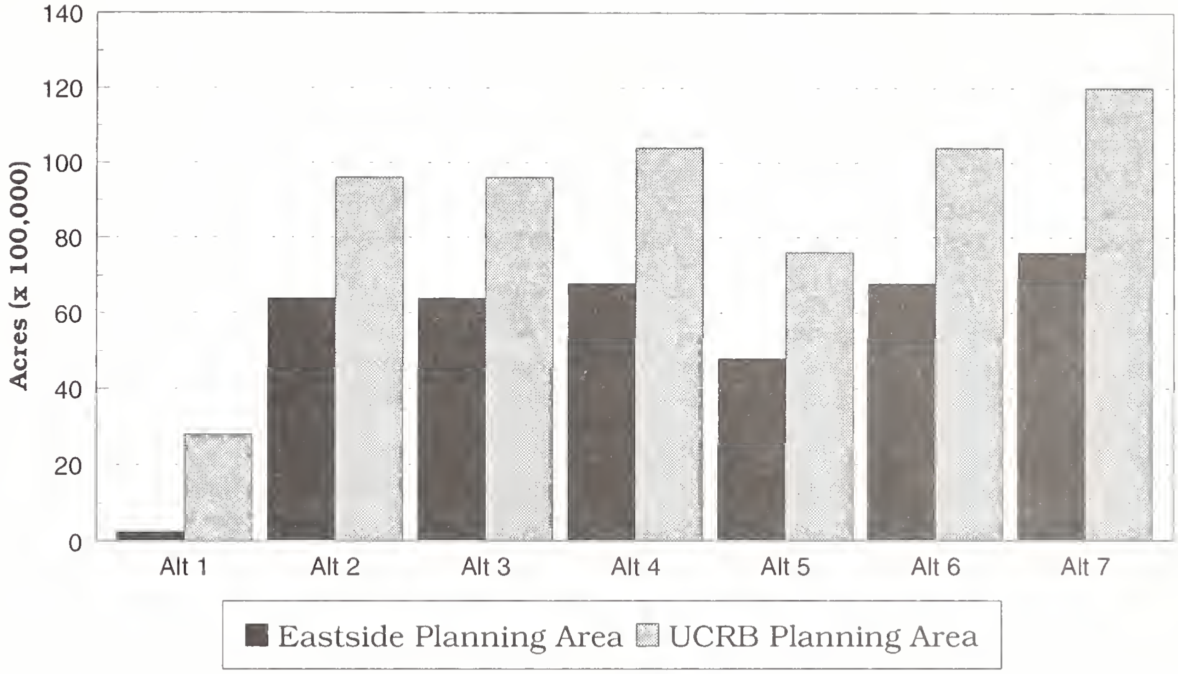


Figure 4-50. Estimated Acres of Forest Service- and BLM-administered Lands Within Riparian Conservation Areas (RCAs), Eastside and UCRB Planning Areas.

Acreage was estimated on the basis of the 1:100,000 stream hydrography, and multiplied by a factor of four to account for under estimation of the actual stream network. This factor was obtained by comparing stream density from 1:24,000 hydrography to 1:100,000 hydrography and relations between stream order and map scale. Riparian widths were estimated for each alternative on the basis of the Riparian Conservation Area standards. Alternatives 2 through 7 do not account for landslide prone areas which would increase acreage. Also, the slope adjustment factor is not included in Alternatives 4, 5, and 6 which would increase acreage.

indirect processes that influence aquatic, riparian and upland environments. However, there would be greater short-term uncertainty associated with Alternative 4 because there is less incentive to conduct Ecosystem Analysis at the Watershed Scale that would integrate objectives and standards to accomplish ecosystem management.

Key, Stronghold, Priority and Category Watersheds, and Unroaded Areas

All alternatives establish priorities for protection and restoration of aquatic resources through watershed designations, although the area and conditions of aquatic resource emphasis vary considerably among alternatives.

In both Alternatives 1 and 2, designation of Key and Priority Watersheds would be based primarily on individual fish species status rather than overall aquatic conditions and priorities. Alternative 1 contains no provision for designation of key or priority watersheds. Consequently, Alternative 1 would not adequately address prioritization objectives on a project-area-wide basis. Alternative 2 includes PACFISH Key Watersheds and INFISH Priority Watersheds. This would result in more of a basin-wide establishment of aquatic priorities than Alternative 1, thus benefiting some watersheds that contain native salmonids.

Prioritization for protection and restoration of aquatic resources in Alternatives 3 through 6 would be defined on the basis of Subbasin Categories identified by the SIT. These subbasin categories, which were determined on overall aquatic conditions, would provide a better mechanism to prioritize protection and restoration activities on a basin-wide basis. Objectives and standards in Alternatives 3 through 7 emphasize protection of Category 1 subbasins and aquatic strongholds within these subbasins and would probably protect existing core areas of many species, and help prioritize restoration activities. In addition to Category 1 subbasin direction, Alternative 3 requires completion of Ecosystem Analysis at the Watershed Scale prior to activities that require an environmental assessment or environmental impact statement in subwatersheds containing wild populations of anadromous fish, PACFISH and INFISH priority watersheds, salmonid strongholds or subwatersheds containing fringe populations of bull trout. Alternatives 4, 5 (outside of timber and livestock priority areas), 6, and 7 require completion of Ecosystem Analysis at the Watershed Scale prior to activities that would affect Federally listed and proposed species and their habitats or their recently occupied or currently accessible habitats. In Alternative 6, there are additional ecosystem analysis requirements for candidate species and for stronghold and fringe populations for redband trout, westslope cutthroat and Yellowstone cutthroat.

Alternatives 6 and 7 require Ecosystem Analysis at the Watershed Scale prior to a net increase in road density in subwatersheds with less than 0.7 road miles per square mile. This requirement would likely benefit aquatic ecosystems. Also in Alternative 7, protection emphasis would be provided for 1000 acre or greater unroaded areas regardless of condition of aquatic resources. Such protection would probably result in benefits to aquatic ecosystems within these areas, but may not result in substantial project area-wide improvements in aquatic resources because of lack of prioritization of activities with respect to project area-wide issues such as habitat connectivity, restoration potential, and fringe and core fish populations. The original intent for protection of unroaded areas greater than 1,000 acres was for terrestrial ecosystem components such as old forest structures and was not part of the aquatic recommendations from the Eastside Scientific Societies Panel (Henjum et al. 1994).

Riparian Management Objectives

Quantitative Riparian Management Objectives (RMOs) are measures of riparian and stream conditions that serve as management targets. It is assumed that aquatic and riparian habitat conditions are satisfactory for native fish species where riparian areas and stream channels meet RMOs. It is also assumed that for watersheds where stream channels and riparian areas are below RMOs, future management actions would not impede attainment of RMOs. In the overall evaluation of the protection of aquatic resources, little weight was given to RMOs because their effectiveness was anticipated to be realized many years to decades after the life of the plan, and time frames for attainment of RMOs were not specified.

Higher certainty of outcomes was expected to result from integrated ecosystem management approaches of Alternatives 3 through 7 than from using instream variables to measure watershed, riparian, and aquatic condition. Alternative 1 provides no project area-wide RMOs. Alternatives 2, 3, 4, 6, and 7 specify project area-wide adoption of RMOs. Alternatives 2 and 3 provide RMOs for pool frequency, width-to-depth ratio, temperature, bank stability, wood, and bank angle as specified in PACFISH and INFISH. Alternatives 4 and 6 have similar RMO variables as Alternatives 2 and 3 but bank angle is not included and RMO variables for fine sediment and riparian vegetation have been added. Most RMO values in Alternatives 4 and 6 come from near pristine stream habitat data collected

within the planning area. Alternative 7 specifies RMOs for the same variables as Alternatives 2 and 3, but for some variables such as bank stability and temperature, the RMO values would be more conservative. Additionally, Alternative 7 would include RMOs for cobble embeddedness and sediment delivery. Because of the additional and more conservative RMOs in Alternative 7, and the restrictions on management activities until RMOs are attained, implementation of Alternative 7 could result in greater short-term benefits to aquatic resources than Alternatives 2, 3, 4, and 6. RMO values could be modified only after conducting Ecosystem Analysis at the Watershed Scale in Alternatives 3, 4, 5 (outside of timber and livestock priority areas), portions of 6 and 7. Development of RMOs appropriate to local conditions would result in greater benefit to aquatic resources than project area-wide prescriptions. Direction specified in Alternative 5 regarding RMOs is identical to Alternatives 4 and 6, except RMOs are not applied in timber and livestock priority areas.

Several important caveats on the use of RMOs for determining risks and certainty of outcomes should be taken into consideration. First, reliance on RMOs tends to focus management on RMOs and not on the goal of maintaining proper ecosystem processes and conditions. Second, establishment of numerical criteria as a target implies that there are known and quantifiable biophysical response thresholds (such as "good" versus "bad" habitat). This is generally not the case: response thresholds are really not known and may not even exist. Third, focus on single values or ranges of values from a small number of instream variables is overly simplistic and potentially misleading because of factors such as natural variability, complex interactions, and the dynamic nature of streams and watersheds. (Aquatics section of the *Evaluation of Alternatives* [Quigley, Lee, and Arbelbide 1997].)

Aquatic Species

Overall effects of the alternatives on aquatic species were qualitatively and quantitatively assessed with respect to: (1) the overall intent and activities associated with the alternative; (2) the expected levels of overall protection offered by the alternatives for watershed and riparian processes and conditions; (3) current status and trends of aquatic species; and (4) the relative importance of Federal land in the full distribution of species.

Aquatic Mollusks

Six Federally listed threatened or endangered aquatic mollusks are found within the UCRB planning area. Only three species occur on BLM-administered lands in Idaho. These species are Banbury Springs lanx (*Lanx* sp.), Bliss Rapids snail (*Taylorconcha serpenticola*), and Utah valvata (*Valvata utahensis*). Effects or viability analyses were not completed due to the landscape-scale nature of the data as compared to the limited and localized distributions of these species. Future viability assessments should be conducted on a site-specific basis.

Introduced Fish Species

Effects analyses were not conducted for introduced fish species. The distribution and status of introduced fish species tend to be influenced by repeated stocking and therefore are not good indicators of changes in habitat condition.

Native Fish Species

Effects analyses and outcomes were directed exclusively at native fish species. The SIT evaluation of native fishes was directed at two major groups: key salmonids, and narrow endemic and sensitive fish species. The key salmonids (bull trout, westslope and Yellowstone cutthroat trout, redband trout, steelhead, and stream- and ocean-type chinook salmon) were selected for analysis because of their importance as broad indicators of aquatic integrity and the large amount of existing information for these species. The analysis for narrow endemic and sensitive species focused on 18 of the 39 identified species in the *Aquatics* chapter of the *Assessment of Ecosystem Components*. The basis for species selection is described in the Methods section and in the *Evaluation of Alternatives* (Quigley, Lee, and Arbelbide 1997). Expected changes in outcomes for reported species do not account for all factors acting upon their distribution and status, and the likely response may vary widely based on landscape characteristics, allocation and implementation of activities, and current status and trends in populations.

The following discussion is derived from the species-specific narratives and other information provided in the *Evaluation of Alternatives*. Basic information used by the SIT in their evaluation included projected management activities within the range of the examined species, and estimated long-term changes in distributions of key salmonids that would follow changes in road densities consistent with the intent and direction of each alternative. Such changes are not expected in the short term (10 years), but rather reflect judgements about how land use patterns might change over the long term (50 to 100 years) if the alternatives were enacted and the intent of the alternatives followed in coming decades. For most species, 10 years is an insufficient time frame to expect substantive differences in effects among alternatives.

Key Salmonids

Bull Trout

Many remaining population strongholds are found within wilderness areas and would likely persist under all alternatives. The riparian management requirements in 2, 3, 4, 6, and 7 would likely conserve strong populations; Alternatives 1 and 5 would not (Table 4-44). Alternatives 2 through 7 provide some potential for active restoration that could benefit depressed bull trout populations. Although Alternative 2 would conserve most core areas and would generally protect aquatic and riparian functions, it is anticipated that little rebuilding of habitat networks would occur, because of low watershed restoration in the long term. The explicit recognition of priority and fringe subwatersheds under Alternative 3 would benefit many populations within those areas. The more extensive restoration activities proposed under Alternative 4 would benefit depressed populations most where they overlap with Federally listed species, steelhead and chinook salmon. Implementation of Alternative 4 leaves some uncertainty regarding the benefits expected for depressed populations. Alternative 6 would provide the greatest opportunity to effectively focus restoration of depressed populations across the species' range. The lower rates of activities and moderate levels of restoration activities suggest some important gains could be made under this alternative. Under Alternative 7, risks to small fragmented and isolated populations would exist due to the lack of restoration activities causing an uncertainty about long-term improvements in the depressed portion of the range. Competition with introduced species and current watershed condition makes it uncertain that any alternative could fully ensure no future declines in depressed populations. None of the alternatives would provide strong guidance or opportunities for securing or restoring migratory corridors in areas outside of Federal lands, which may isolate some populations. Habitat for viable populations of bull trout throughout the core distribution would be expected under Alternatives 2, 3, 4, 6, and 7 with the greatest potential improvement under Alternatives 3, 4, 6, and 7.

Westslope Cutthroat Trout

Westslope cutthroat trout would likely persist throughout most of their current distribution under all alternatives. The distribution and status of healthy populations, however, would be affected by differences among alternatives in terms of riparian and stream protection and levels of land-disturbing activities (Table 4-45). Further population declines would be expected under Alternative 1. Although Alternative 5 would likely conserve much of the core of strong populations in the current range, some healthy populations and the fringe populations found in commodity priority areas would be at risk. It is uncertain if Alternative 2 would conserve core populations because high priority watersheds for both INFISH and PACFISH do not cover all important populations. Alternatives 3, 4, 6, and 7 would likely conserve most of the strong populations and could benefit depressed populations through passive improvement of watershed conditions associated with better riparian management. Populations in highly degraded watersheds or in competition with introduced fishes, however, could continue to decline. Alternatives 3, 4, 6, and 7 offer some potential for strengthening populations and reducing fragmentation of strong populations through expanded watershed restoration, ecosystem analysis, and reduction of land-disturbing activities. Under Alternative 3, such gains would be limited to areas within Category 1 subbasins, strong populations, or to those supporting wild salmon or steelhead, or priority bull trout populations. A greater emphasis on active restoration under Alternatives 4 would provide a greater

Table 4-44. Projected Long-term Effects of the Alternatives on Bull Trout, Project Area.

Will the Alternative?	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
1. Maintain and restore aquatic and riparian habitat and ecological processes on FS/BLM-administered lands?	No	Yes	Yes	Yes	Yes, in non-production priority areas No, in production priority areas	Yes	Yes
2. Protect and restore habitat for strong populations in the central or core portions of the species' range on FS/BLM-administered lands?	No	Yes	Yes	Yes	Yes/No	Yes	Yes
3. Prevent declines in habitats or populations throughout the entire species' range?	No	Uncertain	Uncertain	Uncertain	Uncertain/No	Uncertain	Uncertain
	For reasons beyond Federal land management, some populations may continue to decline. The population condition, trend, and isolation at the subwatershed scale will not be able to improve rapidly enough to prevent population declines in the short-term, given the long time lags required for watershed, rangeland, and forest improvement						
- if "no," where are declines most likely to occur (on FS/BLM-administered lands)?	Outside wilderness and other protected areas	Forest Clusters 3 and 4	Varying levels of success across species' range	Depressed areas subject to high activity outside the range of steel-head and chinook (primarily Forest Cluster 4)	Commodity-emphasis areas and depressed outside the range of steelhead and chinook	Forest Cluster 4	Depressed and fragmented populations outside reserves
4. Restore habitats to support depressed populations?	No	Yes	Yes	Yes	Yes	Yes	Yes
- if "yes", where? INFISH		PACFISH/ Clusters Priority watersheds	Forest levels 2, 4, and 5	Varying of success across species' range	Category 1; Forest Cluster 1 and 2; range of steel-head & chinook	Varying levels of success across species' range	
What is the role of factors other than habitat?	Competition and introgression with introduced fishes can seriously threaten depressed populations, particularly in degraded habitats, and may undermine efforts to rebuild populations in good habitats. Highly-fragmented and isolated populations may risk extirpations even with no further habitat loss.						

opportunity to restore depressed populations, but would be less likely to benefit populations outside the range of Federally listed species, steelhead and chinook salmon. The extensive application of ecosystem analysis under Alternative 6 would offer the best opportunity for active restoration of westslope cutthroat across the range, including the fringe distribution. Long-term effects of Alternative 7 on fragmented and isolated populations would be uncertain due to the lack of restoration actions. Habitat for viable populations of westslope cutthroat trout throughout most of its range would be expected under all alternatives; however, the greatest potential improvement would be expected to occur under Alternatives 3, 4, 6, and 7.

Yellowstone Cutthroat Trout

All alternatives would provide various levels of protection for core areas (Table 4-46). The degree to which degraded habitats would be restored distinguishes the alternatives and leads to the more favorable ratings. Alternatives 3, 6, 7, and potentially 4 would most likely conserve strong populations within the central portion of the species' range. Alternatives 3, 6, and 7 would have the best potential to prevent declines throughout the range of Yellowstone cutthroat trout, while Alternatives 2 through 7 all have provisions for rebuilding depressed populations in at least some portions of the species' range. Alternatives 1, 2 and 5 could be expected to exacerbate declines in Yellowstone cutthroat trout populations outside of specially protected areas such as designated wilderness and National Parks, and would lack a conservation emphasis that would help rebuild depressed populations. None of the alternatives would address needs and opportunities for restoring habitat conditions on non-Federal administered lands. Habitat for viable populations of Yellowstone cutthroat trout would likely occur under all alternatives; however, the greatest potential improvement would be expected to occur under Alternatives 3, 4, 6, and 7.

Redband Trout

Since redband trout are relatively resilient to disturbance, populations on BLM- and Forest Service-administered lands would likely persist throughout most of the present distribution under all alternatives (Table 4-47). Many populations could remain depressed and declines could continue, however, regardless of alternative because of competition with introduced species and latent effects of past management. Alternatives 2, 3, 4, 6, and 7 would conserve most of the core of strong populations; some restoration of depressed populations would be expected through the passive benefits of riparian protection. Similar benefits would be expected under Alternative 5, except in timber and livestock priority areas with increased activities and less riparian and watershed protection. Declines in Alternative 5 would most likely occur where populations overlap livestock priority areas. Increased activity levels imply both greater potential benefits and risks under Alternatives 3, 4, and 6. The uncertainty would be greatest under Alternative 4. Benefits would be most likely under Alternative 6, where extensive requirements for ecosystem analysis would benefit fringe distributions and populations outside the range of steelhead. Habitat for viable populations of redband trout would be likely under all alternatives.

Steelhead

Steelhead have been extirpated from the majority of their historical range. Most remaining steelhead populations are depressed and the long-term persistence of remaining populations is highly uncertain. Because of high mortalities associated with dams and other factors in the ocean and migratory corridors, freshwater habitats could make the important difference between populations that persist and those that go extinct. Conservation or restoration of currently occupied habitats could be critical to the persistence of the remnant populations. All of the alternatives except Alternatives 1 and 5 would conserve most of the habitats that currently support strong populations (Table 4-48). Each of the alternatives would also protect habitats supporting depressed populations to varying degrees, with mixed results. Alternatives 2 and 3 would provide extended protection to steelhead habitats but would provide relatively little emphasis on habitat restoration. Alternatives 1, 3, 4 and 5 involve high levels of timber harvest and thinning activities, which would increase risks for some populations. Increased emphasis on watershed restoration activities under these alternatives could mitigate much of the risk and would provide

Table 4-45. Projected Long-term Effects of the Alternatives on Westslope Cutthroat Trout, Project Area.

Will the Alternative?	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
1. Maintain and restore aquatic and riparian habitat and ecological processes on FS/BLM administered lands?	No	Yes	Yes	Yes	Yes, in non-production priority areas No, in production priority areas	Yes	Yes
2. Protect and restore habitat for strong populations in the central or core portions of the species' range on FS/BLM-administered lands?	No	Uncertain	Yes	Yes	Yes/No	Yes	Yes
3. Prevent declines in habitats or populations throughout the entire species' range?	No	Uncertain	Uncertain	Uncertain	Uncertain/No	Uncertain	Uncertain
	For reasons beyond Federal land management, some populations may continue to decline. The population condition, trend, and isolation at the subwatershed scale will not be able to improve rapidly enough to prevent population declines in the short-term, given the long time lags required for watershed, rangeland and forest improvement.						
- if "no" where are declines most likely to occur (on FS/BLM-administered lands)?	Outside wilderness and other protected areas	Outside INFISH Priority watersheds; Forest Clusters 3, 4, and 5	Outside the application of EAWS; Forest Clusters 3 (western MT) and 4, and Upper Clark Fork	Fringe and depressed populations outside the range of listed species, steel-head and chinook; Western MT	Category 1; overlap with listed species; commodity-emphasis areas		
4. Restore habitats to support depressed populations	No	Yes	Yes	Yes	Yes	Yes	Yes
- If "yes", where?		INFISH and PACFISH Priority watersheds	Forest Cluster 2 and some of 4	Category 1; Forest Clusters 2, 3, and 4	Category 1, overlap with chinook & steelhead	Varying levels of success across species' range	
What is the role of factors other than habitat?	Competition and introgression with introduced fishes can seriously threaten depressed populations, particularly in degraded habitats, and may undermine efforts to rebuild populations in good habitats.						

Table 4-46. Projected Long-term Effects of the Alternatives on Yellowstone Cutthroat Trout within the Basin, UCRB Planning Area.

Will the Alternative?	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
1. Maintain and restore aquatic and riparian habitat and ecological processes on FS/BLM-administered lands?	No	Yes	Yes	Yes	Yes, in non-production priority areas No, in production priority areas	Yes	Yes
2. Protect and restore habitat for strong populations in the central or core portions of the species' range on FS/BLM-administered lands?	No	No	Yes	Yes	Yes/No	Yes	Yes
3. Prevent declines in habitats or populations throughout the entire species' range?	No	No	Uncertain	Uncertain	Uncertain/No	Uncertain	Uncertain
	For reasons beyond Federal land management, some populations may continue to decline. The population condition, trend, and isolation at the subwatershed scale will not be able to improve rapidly enough to prevent population declines in the short-term, given the long time lags required for watershed, rangeland, and forest improvement.						
- if "no" where are declines most likely to occur (on FS/BLM-administered lands)?	Palisades, Salt River, and areas managed most intensively for timber and range commodities	Areas managed most intensively for timber and range commodities	Areas managed most intensively for timber and range commodities	Salt River and areas outside Category 1	Commodity priority areas	Outside Category 1 in depressed and fragmented distributions	Outside reserves in depressed and fragmented distributions
4. Restore habitats to support depressed populations	No	Yes	Yes	Yes	Yes	Yes	Yes
- If "yes", where?		Varying levels of success across species' range depending on intensity and extent of riparian restoration and timber and range management.					
What is the role of factors other than habitat?	Competition and introgression with introduced fishes can seriously threaten depressed populations, particularly in degraded habitats, and may undermine efforts to rebuild populations in good habitats.						

Table 4-47. Projected Long-term Effects of the Alternatives on Redband Trout, Project Area.

Will the Alternative?	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
1. Maintain and restore aquatic and riparian habitat and ecological processes on FS/BLM-administered lands?	No	Yes	Yes	Yes	Yes, in non-production priority areas No, in production priority areas	Yes	Yes
2. Protect and restore habitat for strong populations in the central or core portions of the species' range on FS/BLM-administered lands?	No	Uncertain	Yes	Uncertain	Uncertain in non-production priority areas/ No in production priority areas	Yes	Yes
3. Prevent declines in habitats or populations throughout the entire species' range?	No	No	Uncertain	Uncertain	Uncertain/No	Uncertain	Uncertain
	For reasons beyond Federal land management, some populations may continue to decline. The population condition, trend, and isolation at the subwatershed scale will not be able to improve rapidly enough to prevent population declines in the short-term, given the long time lags required for watershed, rangeland, and forest improvement.						
- if "no" where are declines most likely to occur (on FS/BLM-administered lands)?	Outside wilderness and other protected areas	Allopatric form outside INFISH priority areas, and Range Cluster 6	Allopatric form outside INFISH priority areas, and Range Cluster 6	Allopatric distribution outside the range of listed species, steel-head, and chinook especially range Cluster 6	Allopatric distribution outside listed species especially EEIS and Wood and Kootenai; Range Cluster 6	Range Cluster 6	Western portion of Range Cluster 6; Harney and Goose Lake sub-basins
4. Restore habitats to support depressed populations	No	Yes	Yes	Yes	Yes	Yes	Yes
- If "yes", where?		Varying levels of success across species' range depending on intensity of riparian restoration and livestock management activities.					
What is the role of factors other than habitat?	Competition and introgression with introduced fishes can seriously threaten depressed populations, particularly in degraded habitats, and may undermine efforts to rebuild populations in good habitats.						

important restoration of current and potential future habitats. The ecosystem analysis requirements of Alternatives 3 through 7 would provide such opportunities. Alternative 6 contains lower levels of land-disturbing activity and a more conservative and adaptive approach, which would benefit populations across the range. Continuing declines would most likely occur under Alternatives 1 and 5, particularly in timber and livestock priority areas outside Forest Clusters 1 and 2. Alternative 7 with the implementation of conservation reserves, reduced land-disturbing activities, and a restrictive riparian management strategy would likely conserve much of the remaining habitat. Some degraded habitats, however, may be restored more slowly or even decline further with limited emphasis on active restoration. It would be unlikely that any activities on Federal lands would result in strong rebuilding of steelhead trout populations without substantial improvements in other factors influencing these populations. If conditions outside spawning and rearing habitats remain poor, it is possible that many remaining stocks would continue to decline. Also see the Cumulative Effects on Aquatic Ecosystems discussion at the end of the Aquatics Effects section. Habitat for viable populations and habitat trends toward viability for Federally listed stocks would be likely under Alternatives 3, 4, 6, and 7, however the greatest potential habitat improvement would be expected to occur under Alternative 6.

Stream-type Chinook Salmon

Most remaining stream-type chinook salmon populations are depressed and strong populations are rare. In the absence of strong populations, subwatersheds that retain high genetic integrity and those supporting naturally reproducing populations are vital to the species' persistence (Lee et al. 1996 in Quigley, Lee, and Arbelbide 1997). Alternative 1 would likely contribute to continued declines in stream-type chinook salmon across their range (Table 4-48). Alternative 2 would likely protect the few remaining strong populations, but would be unlikely to prevent declines in other portions of the species' range or to help rebuild depressed populations in areas with degraded habitat. Alternative 3 would conserve remaining strong populations, but may not prevent further declines in areas in need of aggressive restoration. Alternative 4 can conserve strong populations, prevent further declines in habitats and populations, and help rebuild depressed populations in degraded areas but only if watershed restoration, guided by ecosystem analysis, is effective in improving habitat conditions. Alternative 5 would not be expected to conserve remaining strong populations or prevent further declines in populations, though it could help rebuild some depressed populations. Alternative 6 is similar to Alternative 4, but would apply a more conservative and adaptive approach to restoration that would benefit stream-type chinook salmon stocks throughout their range. Alternative 7 would provide a system of reserves to conserve core areas and restrictive RCAs that would protect strong populations, but depressed populations in currently degraded habitats outside of reserves may continue to decline. None of the alternatives would address the needs and opportunities for restoring habitat conditions outside Federal lands, nor do they address the need for a comprehensive approach to restoring stream-type chinook salmon habitat and alleviating causes of mortality in freshwater spawning and rearing areas, migration corridors, estuaries, and the ocean. Without a comprehensive approach, even those alternatives that most benefit stream-type chinook salmon could not be expected to ensure persistence. Also see the Cumulative Effects on Aquatic Ecosystems discussion at the end of the Aquatics Effects section. Habitat for viable populations and habitat trends toward viability for Federally listed stocks would be likely under Alternatives 3, 4, 6, and 7, however the greatest potential habitat improvement would be expected to occur under Alternative 6.

Ocean-type Chinook Salmon

It is expected that none of the alternatives would provide for the habitat requirements of the species, manage perceived threats, or ensure persistence of ocean-type chinook salmon populations. Unlike stream-type chinook, ocean-type chinook salmon are less affected by Forest Service or BLM land management because the species is dependent on lower-elevation mainstem river habitats. The species is proportionally more affected by a large number of other factors outside of or BLM- or Forest Service-administered lands in freshwater, estuaries, and the ocean. Recent declines in ocean-type chinook stocks can be

Table 4-48. Projected Long-term Effects of the Alternatives on Steelhead Trout and Stream-type Chinook Salmon, Project Area.

Will the Alternative?	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
1. Maintain and restore aquatic and riparian habitat and ecological processes on FS/BLM administered lands?	No	Yes	Yes	Yes	Yes, in non-production priority areas No, in production priority areas	Yes	Yes
2. Protect and restore habitat for strong populations in the central or core portions of the species' range on FS/BLM-administered lands?	No	Uncertain	Yes	Yes	Yes/No	Yes	Yes
3. Prevent declines in habitats or populations throughout the entire species' range?	No	Uncertain	Uncertain	Uncertain	Uncertain/No	Uncertain	Uncertain
	For reasons beyond Federal land management, some populations may continue to decline. The population condition, trend, and isolation at the subwatershed scale will not be able to improve rapidly enough to prevent population declines in the short-term, given the long time lags required for watershed and forest improvement.						
- if "no" where are declines most likely to occur (on FS/BLM-administered lands)?	Outside wilderness and other protected areas	Forest Cluster 3	Forest Cluster 5	Forest Clusters 3, 4, and 5	Commodity priority areas	Forest Clusters 3, 4, and 5	Outside reserves in currently degraded watersheds
4. Restore habitats to support depressed populations	No	Yes	Yes	Yes	Yes	Yes	Yes
- If "yes", where?		PACFISH priority watersheds; Forest Clusters 1 & 2	Category 1 subbasins, Forest Clusters 1, 2, and 5			Varying levels of success across species' range	
What is the role of factors other than freshwater habitat?	The combined effects of hydropower operations, hatcheries, and harvest may limit increases in wild populations in areas where freshwater spawning and rearing habitats are restored. Similarly, protection of high-quality freshwater habitats will not guarantee population persistence without mitigation of other factors. Fluctuating ocean condition may mask habitat related responses. Depensitory effects could restrict populations even when other factors are positive.						

attributed primarily to the construction and operation of mainstem dams on the Columbia and Snake Rivers. With some exceptions, the resilience, persistence, and viability of ocean-type chinook salmon stocks would be largely dependent on the quality and diversity of mainstem habitats outside of BLM- or Forest Service-administered lands. Because Alternatives 6 and 7 would most likely benefit aquatic ecosystems, these alternatives could result in some benefit to ocean-type chinook salmon, primarily because of improved water quality and quantity on BLM- or Forest Service-administered lands and because of reductions in road densities, reduced timber harvest, improved grazing practices, and protection of riparian areas. Mainstem areas might benefit from land management actions that greatly reduce sediment and ensure an abundant supply of water with suitable chemical and physical characteristics during key life history stages of ocean-type chinook. It is uncertain if these effects would benefit species persistence and viability. The remainder of the alternatives (Alternatives 1 through 5) would not benefit ocean-type chinook salmon because these alternatives continue land-disturbing activities. To ensure persistence and viability, a comprehensive approach is needed that addresses the host of factors that affect ocean-type chinook both on and off BLM-or Forest Service-administered lands.

Narrow Endemic and Sensitive Native Fish Species

Pacific Lamprey

Since Pacific lamprey spawning and rearing areas tend to overlap with steelhead spawning and rearing areas and both are affected by dams and hydroelectric operations, it is assumed that effects would be similar to steelhead. Refer to the preceding section on steelhead for effects on Pacific lamprey.

Pygmy Whitefish

Persistence and habitat to support viable populations of pygmy whitefish would occur under any alternative; however, Alternatives 1 and 5 offer less stream and riparian habitat protection than other alternatives.

Leatherside Chub

Because of the lack of distribution and habitat requirement data, an effects analysis for the species was not conducted.

Wood River Sensitive Fishes

The Wood River sculpin and Wood River bridgelip sucker inhabit Idaho's Big and Little Wood subbasins. Because of similar ranges, habitat requirements, and threats, both species were subjected to the same effects analysis. Alternatives 1 and 5 would result in the continued decline in habitat conditions for both species because of high timber harvest and livestock grazing levels combined with low stream/riparian protection measures. Habitat conditions under Alternative 2 would improve as compared to Alternative 1 due to lower levels of timber harvest and greater stream/riparian protection measures. Alternative 3 would be similar to Alternative 2 except that timber harvest and watershed and riparian restoration levels are slightly higher. Effects of Alternatives 4 and 6 are similar and would result in better habitat conditions than Alternatives 2 and 3 because of higher restoration levels. Alternative 7 would result in the greatest habitat improvement for both species because of greater stream/riparian protection measures and more restrictions on livestock riparian grazing and timber harvest. Habitat to support viable populations would likely occur under Alternatives 2, 3, 4, 6, and 7, with the greatest potential for improvement in Alternatives 4, 6, and 7.

Torrent Sculpin

Current distribution and status information is limited. Since the torrent sculpin inhabits many of the same habitats as and has similar habitat requirements to westslope cutthroat trout or redband trout, alternative effects and changes in viability would be similar. Unlike westslope cutthroat or redband trout, however, if eliminated from a river system torrent sculpins are unlikely to recolonize without human assistance. For successful restoration, transplants of sculpin into restored areas may be necessary. Refer to preceding effects discussion for westslope cutthroat trout or redband trout depending on overlap of distribution for how alternatives would affect torrent sculpin.

Shorthead Sculpin

Current distribution and status information is limited. Since the shorthead sculpin inhabits many of the same habitats and has similar habitat requirements to bull trout, alternative effects and changes in viability would be similar. Unlike bull trout, however, if eliminated from a river system shorthead sculpins are unlikely to recolonize without human assistance. For successful restoration, transplants of sculpin into restored areas may be necessary. Refer to preceding effects discussion for bull trout for how alternatives would affect shorthead sculpin.

Threatened and Endangered Aquatic Species

All Federally threatened and endangered species whose occupied ranges overlapped more than one National Forest or BLM District and could be affected by land management activities were selected for effects and viability evaluation by the Aquatic staff of the SIT. Discussion of effects for selected listed species are presented in preceding sections. Five Federally listed species did not meet the selection criteria: white sturgeon (Kootenai River), Hutton tui chub, Borax Lake chub, Foskett speckled dace, and sockeye salmon (Snake River). Of these five species, white sturgeon and sockeye salmon were deemed to be minimally affected by land management activities, while the remaining three species would be best addressed by individual administrative units.

The effects on threatened and endangered species described in the previous sections were based on the *Evaluation of Alternatives*. Under the Endangered Species Act, federal activities that may have an effect on threatened, endangered, or proposed species are subject to consultation with the U.S. Fish and Wildlife Service or National Marine Fisheries Service. Requirements for consultation would remain in effect under any selected alternative. If the selected alternative may have an effect on threatened, endangered, or proposed, biological assessment(s), appropriate for the scale of the decision, will be submitted to U.S. Fish and Wildlife Service and National Marine Fisheries Service for consultation. Consultation will be completed prior to any ground-disturbing activities.

Cumulative Effects

No alternative specifically addresses the role of non-Federal lands with respect to aquatic ecosystems. For assessing the role of non-Federal lands in the maintenance of aquatic ecosystems, it was assumed that there would be no systematic and project area-wide strategy for protecting ecological processes on non-Federal lands, and that aquatic ecosystem conditions would likely remain degraded where conditions are presently below ecological potential. This conclusion was based on the following considerations as described in the *Evaluation of Alternatives* (Quigley, Lee, and Arbelbide 1997).

- ◆ The goals of States' natural resource agencies are generally not specifically aimed to protect aquatic ecosystems and biodiversity, but to meet societal needs while disrupting ecological processes and conditions as little as possible.
- ◆ State regulations for forest and range practices do not fully protect riparian processes and functions.
- ◆ Site-specific information regarding aquatic species conditions and habitat requirements on non-Federal lands is generally not sufficient for effective management.
- ◆ Implementation of State requirements for protection of aquatic ecosystems are uncertain.
- ◆ The current lack of a comprehensive multi-agency and landowner aquatic conservation approach limits the opportunity to effectively conserve and restore wide-ranging fish species.

However, it is recognized that States have begun development of conservation strategies to reduce threats and restore habitat for rare or imperiled aquatic species. For example, Montana and Idaho are developing bull trout conservation plans cooperatively with Federal agencies, tribal governments, and other landowners. The effects of these plans are unknown since most are not yet fully developed or implemented.

On a relative scale, Alternatives 6 and 7 would provide the highest short-term benefits to

riparian and aquatic environments because of riparian area protection requirements and reduced rates of management activities that could negatively affect these resources on Federal lands. Alternatives 4 and 6 would provide the highest long-term benefits. The lack of active watershed, rangeland, and forest restoration in Alternative 7 could pose risks to riparian and aquatic environments in the long term. Alternative 4 would have similar benefits to Alternatives 6 and 7, but has a greater uncertainty of ecological outcomes due to higher amounts and rates of activities over the short term, and reduced reliance on ecosystem analysis relative to Alternative 6. Alternatives 2 and 3 would benefit riparian and aquatic environments due to riparian area protection requirements, but to lesser degrees than Alternatives 4, 6, and 7. However, conservation and restoration emphasis in Alternative 2 would be based in fine scale standards and would not integrate landscape and watershed considerations into a coherent management strategy consistent with disturbance regimes. Alternative 3 would provide slightly greater benefits than Alternative 2 due a greater emphasis placed on ecosystem management and watershed restoration. Alternatives 1 and 5 would provide the least overall protection to riparian and aquatic environments. Alternative 1 would not be expected to lead to recovery of aquatic and riparian environments because of a lack of a comprehensive riparian protection and recovery strategy. Although aquatic, wildlife, and recreation priority areas in Alternative 5 would have the same level of protection as Alternatives 4 and 6, reduced riparian protection outside these priority areas would be expected to result in broad-scale fragmentation of aquatic and riparian environments.

Generally, the greatest short-term improvement in threatened and endangered and native fish distribution and status on Federal lands would occur under Alternatives 6 and 7, mainly due to greater riparian protection measures and lower rate of land disturbance. Alternatives 4 and 6 would provide the highest long-term benefits and improvements. Long-term effects of Alternative 7 could pose an uncertain risk to isolated and fragmented populations due to a lack of an active restoration emphasis. Effects of Alternatives 4 and 6 on distribution, status trends, and habitat would be similar to Alternative 7, except that improvements in habitat would be at some risk in the short term under Alternative 4. Generally under Alternative 3, distribution and status trend increases would be less than Alternative 4 due to the lower rates of restoration and higher levels of land disturbance within portions of species' ranges. Trends under Alternative 2 would be uncertain because many important populations are not covered by INFISH and PACFISH priority watersheds and the alternative lacks an ecosystem approach. Alternative 1 and Alternative 5 inside livestock and timber priority areas would result in a decrease in species distribution and status due to low protective measures for riparian areas and inadequate ecosystem management planning. None of the alternatives would address needs and opportunities for restoring habitat conditions on other land ownerships.

No alternative would ensure the persistence and viability of ocean-type chinook salmon, but Alternatives 6 and 7 may provide some benefits to mainstem river spawning and rearing habitat. Alternatives 3, 4, 6, and 7 would improve existing habitat conditions for steelhead and stream-type chinook salmon while the other alternatives would result in a continued decline in condition. However, no alternative addresses the need for a comprehensive approach to restoring anadromous fish stocks on Federal and non-Federal lands and alleviating causes of mortality in all life stages. Snake River stocks of ocean and stream-type chinook are Federally listed as threatened, and steelhead are proposed for Federal listing. Recent declines in anadromous fish stocks can be attributed primarily to construction and operation of mainstem Columbia and Snake River dams.

In Chapter 2, a sidebar discusses the effects of hydropower, hatcheries, harvest, and habitat on interior Columbia River Basin anadromous fishes. This sidebar is summarized below to address cumulative effects on anadromous fishes.

Downstream stresses associated with the hydropower system are one of the major causes of declining anadromous fish runs in the Snake River, notwithstanding land use activities in the watersheds. Federal efforts are underway to address these problems through increased spill, barging, and monitoring. Other potential confounding stresses come from situations

beyond human control, such as ocean conditions and drought. Mid-Columbia anadromous stocks (for example John Day and Deschutes Rivers) are influenced less by hydropower due to a lower number of dams below spawning and rearing areas. Habitat degradation is another important factor in the decline of salmon and steelhead.

Maintenance, expansion, and reconnection of high-quality habitats are vital to the persistence of populations but the magnitude of effects varies from subbasin to subbasin. High quality habitat alone is no guarantee of increased persistence without a comprehensive approach that addresses all mortality factors acting upon individual populations. Additional high quality habitat alone could increase abundance of individual fish but it would not likely reverse current negative population trends in the short term. Assuming mainstem conditions are resolved in the longer term, and if the objective is to support the full expression of life histories and species, then it would be necessary to conserve and restore broader habitat networks than currently exist.

Salmon population numbers in much of the interior Columbia Basin are far below what current habitat conditions could likely support under a scenario of increased downriver survival. Some remote areas (wilderness and other protected areas) in central Idaho and northern Cascades, potentially could support hundred-fold increases or better in adult numbers. However, this is not the case everywhere. Existing habitat conditions in some areas, such as the John Day, Deschutes and Grande Ronde Rivers and Panther Creek, would likely not be sufficient to support increases in returning adults resulting from improvement in downstream survival. In such places, there is a need to increase egg-to-smolt survival where it is currently depressed by habitat degradation.

Without a comprehensive approach that addresses all causes of mortality, the expected benefits from Alternatives 3, 4, 6, and 7 would not ensure persistence of anadromous fish stocks within the project area.

Effects of the Alternatives on Landscape Health

Introduction

Healthy landscapes are those landscapes whose processes (including the production of human commodity and amenity values) are in balance (ecological cause and effect). This balance is dynamic; humans have the opportunity to work strategically with changing landscape conditions to receive a predictable and reliable flow of both commodities (such as timber and livestock production) and amenities (such as scenic values, clean air and water, and recovery of habitats for rare fish and wildlife). In essence, balance represents the "best fit" of dynamic interactions of human land use, fish and wildlife habitats, and ecosystem health within the limitations of the biophysical system and inherent disturbance processes. Systems with a healthy balance show a resilience to disturbance and predictable changes that follow "expected" ecological cause-and-effect relationships, which can be observed or predicted based on the historical system or understanding alterations of that system. Assessing landscape health is a process which links the "driving variables" of key ecological processes and predicts responses at various landscape scales. Key processes can be categorized into hydrologic and land systems, carbon-nutrient systems, human systems, terrestrial and aquatic food webs, and evolutionary systems.

In the *Evaluation of Alternatives* by the Science Integration Team, the summary of data within hierarchical spatial scales (looking at geographical areas in context with larger and smaller areas) provided:

- broad-scale contexts within the Interior Columbia Basin Ecosystem Management Project area;
- connections within and among subbasins; and
- information about:
  - elements (such as large trees and snags),
  - processes (such as productivity, fire, and drought),
  - functions (such as trees that provide perching and nesting habitats), and
  - patterns (mosaics of succession and disturbance).

The Science Integration Team also used temporal scales (looking at different points in time), which provided an understanding of ecological causes and effects; these temporal scales included the historical range of variability, early and recent historical periods, and current period. Temporal scales for future projections considered the short term (next 10 years), and the long term (50- to 100-years). The SIT's evaluation of landscape health was used to determine outcomes for selected variables that integrate the ecological causes and effects on the landscape.

For more detailed information on the analysis process, the models used, and the reasons for selecting the specific variables, see the appropriate sections for Proper Functioning Landscape Systems in the Landscape Assessment (Hann et al., in Quigley, Lee, and Arbelbide 1996).

What is Landscape Health?

Consider building a house with no plan except for the individual visions of the carpenter, plumber, and electrician. There is high risk that the outcome would not represent the house desired by the homeowner. Having a house plan, on the other hand, provides a way to compare different possible outcomes so a choice can be made on what type of house to build. The house plan can be used by the carpenter, plumber, and electrician to produce the chosen outcome. The landscape health (proper functioning landscape systems) assessment in the Assessment of Ecosystem Components (Quigley, Lee, and Arbelbide 1996) provides a framework, much like a house plan, for modeling future landscapes and strategically planning (over time and in various places) ecological conservation, restoration, or production activities, or traditional production or protection activities.

Variables and Predicted Results

The landscape health evaluation was based on 20 variables, which are indicators of one or more of the key landscape systems: human, hydrologic, carbon-nutrient, food web, and evolution (see (table 4-49).

In the next 10 years, none of the alternatives would change ***rangeland landscape patterns*** to healthy landscapes because landscape patterns of rangeland vegetation composition and structure respond very slowly to changes in management. In the long term (50- to 100-years), Alternatives 4 and 6 would show a high rate of transition toward healthy landscapes, and Alternative 3 would show a moderate trend toward healthy landscapes. Alternatives 5 and 7 would have a low rate of transition, and Alternatives 1 and 2 would result in no change.

Forest landscape patterns respond faster than range landscapes. While Alternatives 1, 2, 3, 5, or 7 would show no change in trend toward healthy landscapes in the next 10 years, Alternative 4 would produce a moderate transition in the short term and a high transition rate to healthy landscapes in the long term. Alternative 6 would result in low achievement of healthy landscapes in the short term but moderate in the long term. Alternative 6 would respond at a slower rate in the long term than Alternative 4, because the low rate of activities in the next 10 years would result in substantial differences in disturbance and succession. The long-term trend for forest landscape patterns in Alternatives 1 and 2 would not change, while Alternatives 3, 5, and 7 would result in a low rate of transition to healthy landscapes.

The ***forest-rangeland landscape mosaics*** are similar to the range landscapes in that none of alternatives would result in a transition to healthy landscapes in the short term, because of slow response to changes in management. However, in the long term, the response of the forest-rangeland landscape mosaics would differ from either forest or rangeland landscapes. Alternative 4 would produce a high positive trend toward healthy landscapes, and Alternatives 3 and 5 would show a low trend toward healthy landscapes, with Alternative 6 ranking as moderate. Alternatives 1, 2, and 7 would result in continued transition away from healthy landscapes; Alternative 7 would not produce a net transition because the dynamics of fire, fuels, exotic plants, and succession within reserves would not trend toward a healthy balance in the long term.

In the short term, Alternatives 3 and 4 would result in a moderate trend toward healthy landscapes in ***dry grass and dry shrub potential vegetation groups,*** due to the strong emphasis on perennial grass and shrub restoration through control of noxious weeds and management to reduce cheatgrass and other exotic annuals. In contrast, there would be no trend toward healthy landscapes for Alternatives 1 and 2, and only a low rate of transition to healthy landscapes for Alternatives 5, 6, and 7. In the long term, Alternative 4, with its high restoration emphasis, would result in a high transition toward healthy landscapes. Alternatives 3, 6, and 7 would reach a moderate transition level to healthy landscapes in the long term, and Alternative 5 would remain low in its ability to achieve healthy landscape systems. Alternatives 1 and 2 would continue their trend away from healthy landscapes in the long term.

In the short term under Alternatives 3,4, 5, and 7, the ***cool shrub potential vegetation group*** would result in a moderate trend toward healthy landscapes due to relatively rapid response of cool shrublands to treatments such as improved grazing management or weed control compared to the dry shrub and grass potential vegetation groups. Alternative 6 has a low trend because of a lower level of activities in the next 10 years. In contrast, cool shrublands would not trend toward healthy landscapes under Alternatives 1 and 2, in either the short or long term. In the long term, Alternatives 4 and 6 would result in a high transition to healthy landscapes due to a high emphasis on restoration, including livestock grazing management. Alternatives 3, 5, and 7 would show a moderate trend toward healthy landscapes.

In the short term under Alternatives 3, 4, 5, and 7, the ***woodland potential vegetation group*** would produce a low trend toward healthy landscapes due to limitations in technology. Alternative 6 would result in moderate transition to healthy landscapes due to emphasis on technology development; Alternatives 1 and 2 would show no trend

Table 4- 49. Ranking of Action Alternatives For Ability to Achieve Landscape

Variable	Alternative 1 1st decade	Alternative 1 long-term	Alternative 2 1st decade	Alternative 2 long-term
Range Landscape Patterns	N	N	N	N
Forest Landscape Patterns	N	N	N	N
Forest-Range Landscape Patterns	N	N	N	N
Dry Shrub & Grass PVG Desired Sn/Dist Regime	N	N	N	N
Cool Shrub PVG Desired Sn/Dist Regime	N	N	N	N
Woodland PVG Desired Sn/Dist Regime	N	N	N	N
Range Riparian PVG Desired Sn/Dist Regime	N	L	L	M
Dry Forest PVG Desired Sn/Dist Regime	N	N	N	N
Moist Forest PVG Desired Sn/Dist Regime	N	N	N	N
Cold Forest PVG Desired Sn/Dist Regime	N	N	N	N
Alpine PVG Desired Sn/Dist Regime	L	L	L	L
Desired Reduction in Forest Soil Disturbance	N	N	L	M
Desired Reduction in Range Soil Disturbance	N	N	N	L
Forest Noxious Weed Risk Reduction	N	N	N	N
Range Noxious Weed Risk Reduction	N	N	N	N
Landscape-scale Terrestrial Habitats	N	N	L	L
Landscape-scale Riparian Habitats	N	N	L	L
Fire Risk Reduction in Wildland Interface	L	L	N	N
Desired Human Commodity Values	H	M	M	L
Desired Human Amenity Values	L	L	L	M
Summary	N	N	N	L

[1] Healthy landscape systems - those landscapes whose processes are in dynamic balance, such that the rates and routes of key processes and disturbances are resilient and have predictable responses to disturbance, while producing human values. The ecological systems that interact in dynamic balance include: the human system; hydrologic and land system; carbon-nutrient system; food web system, evolutionary system, and role of toxins in the system.

N=No trend to healthy landscapes; L=Low trend to healthy landscapes; M=Moderate trend to healthy landscapes; H=High trend to healthy landscapes.

Health, UCRB Planning Area.

Alternative 3		Alternative 4		Alternative 5		Alternative 6		Alternative 7	
1st decade	long-term	1st decade	long-term	1st decade	long-term	1st decade	long-term	1st decade	long-term
N	M	N	H	N	L	N	H	N	L
N	L	M	H	N	L	L	M	N	L
N	L	N	H	N	L	N	M	N	N
M	M	M	H	L	L	L	M	L	M
M	M	M	H	M	M	L	H	M	M
L	H	L	H	L	M	M	H	L	M
M	H	M	H	L	M	M	H	M	H
M	H	M	H	L	M	L	H	L	L
M	M	M	H	M	M	L	H	L	L
M	M	M	H	M	M	L	H	L	L
M	M	M	M	L	M	M	M	L	M
M	M	M	M	L	M	M	M	L	L
M	M	M	M	L	M	M	H	L	M
H	H	H	H	L	L	M	M	M	M
H	H	H	H	L	L	M	M	M	M
L	L	M	M	N	L	L	M	L	M
M	M	H	H	L	M	M	H	M	M
M	H	H	H	L	L	L	H	L	M
M	M	M	H	M	M	L	M	L	L
M	M	M	H	L	M	M	H	M	M
M	M	M	H	L	L	L	H	L	M

Abbreviations Used in this Table:
PVG = Potential vegetation group
Sn/Dist = Succession/Disturbance

toward healthy landscapes. In the long term, Alternatives 3, 4, and 6 would produce a high trend toward healthy landscapes; Alternatives 5 and 7 would produce a moderate trend; and Alternatives 1 and 2 show no trend toward healthy landscapes.

In the short term, the strong emphasis on riparian restoration in Alternatives 3, 4, and 6 is predicted to produce a moderate trend toward healthy landscapes in the ***rangeland riparian potential vegetation group***. A moderate transition to healthy landscapes is also predicted for Alternative 7 as a result of the removal of livestock grazing pressure. Alternatives 2 and 5 would have a low rate of trend, and Alternative 1 would show no transition toward healthy landscapes. In the long term, Alternatives 1 and 5 would result in a low, Alternative 2 in a moderate, and Alternatives 3, 4, 6, and 7 in a high trend toward healthy landscapes.

Historically, in the ***dry forest potential vegetation group***, a mixture of stable and cyclic succession/disturbance regimes were produced with mosaics of open to somewhat closed forests dominated by ponderosa pine or Douglas-fir. Similar disturbance effects need to be restored or imitated for the dry forest potential vegetation group to trend toward healthy landscapes. In the short term, Alternatives 1 and 2 would result in no trend to healthy landscapes. Alternatives 3 and 4 would produce a moderate trend to healthy landscapes, with Alternative 4 showing a quicker shift toward healthy landscapes because of its emphasis on restoration. Alternatives 5, 6, and 7 show a low trend due to low rates of restoration. In the long term, Alternatives 3, 4, and 6 would produce a high trend toward healthy landscapes because of the emphasis on prescribed fire, thinning dense stands, and promoting early seral shade-intolerant and large trees. Alternative 5 would show a moderate trend toward healthy landscapes, Alternative 7 would be low, and Alternatives 1 and 2 would result in no trend to healthy landscapes in the long term.

The ***moist forest potential vegetation group*** includes some of the most productive land in the project area. In the absence of disturbance, biomass accumulates rapidly and competition for available carbon and water increases. Achieving healthy landscapes would mean increasing the amount of late-seral forest with a corresponding decrease in mid-seral forest, as well as promoting ponderosa pine, western larch and western white pine. In the short term, Alternatives 3, 4, and 5 would result in a moderate trend to healthy landscapes, while Alternative 6 would be low. In the long term, Alternatives 4 and 6 would have a high transition toward healthy landscapes because of their restoration emphasis. Alternatives 3 and 5 would have a moderate transition rate toward healthy landscapes. In the short and long term, Alternatives 1 and 2 would show no trend toward healthy landscapes and Alternative 7 would show a low trend due to the imbalance of succession and disturbance in reserves and the lack of emphasis on western white pine restoration.

Unlike the dry and moist forests, the ***cold forest potential vegetation group*** has less frequent disturbance and slower succession rates; therefore, conditions generally are closer to the historical range of variability. However, traditional fire suppression practices have resulted in simplification of landscape patterns, and whitebark pine is declining rapidly from effects of blister rust and fire exclusion. In the short term, Alternatives 3, 4, and 5 would have a moderate trend and Alternative 6 would have a low trend toward healthy landscapes. In the long term, Alternatives 4 and 6 would have a high probability of transition to healthy landscapes because of their emphasis on restoration, while Alternative 5 would have a moderate trend. In the short and long term, Alternative 7 would result in a low transition to healthy landscapes because of imbalance between successional conditions and disturbance processes and the lack of emphasis on whitebark pine restoration; and Alternatives 1 and 2 would result in no trend toward healthy landscapes.

The ***alpine potential vegetation group*** is a sensitive ecosystem which has low productivity and slow rates of succession. Because of the slow rates of response to restoration, none of the alternatives would produce a high trend toward healthy landscapes in either the short or the long term. Alternatives 1 and 2 rated low, and Alternatives 3, 4, and 6 rated moderate in trend toward healthy landscapes in the short and long term. Alternatives 5 and 7 rated low in the short term and moderate in the long term.

Alternatives that would increase the amount and intensity of ***forest soil disturbance*** would be more likely to harm soil stability, function, and productivity. Soil disturbance can come from a number of sources, including timber harvest and thinning, wild and prescribed fires, roads, recreation, and livestock and wildlife grazing. Alternative 1 would have the greatest amount of soil disturbance in the long and short term with no trend toward healthy landscapes. Alternatives 2, 5, and 7 would result in low probability of reducing soil disturbance in the short term. This trend would remain low for Alternative 2 in the long term. Alternatives 3, 4, and 6 would result in a moderate trend to healthy landscapes in the short and long term, because of higher levels of restoration activities or mitigation for best management practices (BMPs) that resemble natural succession/disturbance regimes. Alternatives 5 and 7 would have low rates in the first decade increasing to moderate levels in the long term.

The emphasis on soil protection through improved vegetation management and livestock grazing systems, and the resultant improvements in residual cover, would produce a moderate trend toward reduction in ***rangeland soil disturbance*** in the short and long term under Alternatives 3 and 4. For Alternative 6, this moderate trend would improve to high in the long term. Alternatives 5 and 7 would produce a low trend in the short term because of their lack of restoration emphasis that would reduce exotic plant invasion or effects of severe wildfire. In the long term, both alternatives would increase to moderate. Alternatives 1 and 2 show no ability to achieve healthy landscapes in either the short or the long term.

In *forest and rangeland systems*, Alternatives 3 and 4, with their high emphasis on noxious weed control, would produce a high trend toward ***noxious weed risk reduction*** in both the short and long term. Alternatives 6 and 7, with less emphasis on activity levels that would reduce noxious weed spread, would produce a moderate trend toward healthy landscapes in both the short and long term. Alternative 5 would show a low trend and Alternatives 1 and 2 would show no trend toward weed reduction and healthy landscapes in both the short and long term.

In the short and long term, Alternative 4 would show moderate trends toward improving ***landscape-scale terrestrial habitats*** due to the emphasis on active restoration of those habitats. In the short term, Alternatives 2, 3, 6, and 7, which have a lower emphasis on restoration activities, would show a low trend and Alternatives 1 and 5 would show no trend toward improving landscape-scale terrestrial habitats. In the long term, Alternatives 4, 6, and 7 would produce moderate trends toward improvement, but none of the alternatives would produce high trends. The connectivity of terrestrial species populations has been altered by land uses and land ownership patterns that have fragmented many species habitats. This loss of connectivity prevents these fragmented populations from interbreeding, which puts them at risk. There is little that can be done on BLM- or Forest Service-administered lands alone, relative to landscape-scale conditions, to improve healthy landscapes above moderate levels.

Alternative 4 would show a high trend toward improvement of ***landscape-scale riparian habitats*** in both the short and long term. Alternative 6 would show a moderate ability to achieve healthy landscapes in the short term and a high rate in the long term. In the short and long term, Alternatives 3 and 7 would show a moderate trend and Alternative 1 would show no trend toward improvement of landscape-scale riparian habitats due to the lack of restoration. Alternative 5 has low and moderate trends for the short and long term, respectively. Although Alternative 2 would provide for more protection of riparian habitats, the lack of active restoration and fragmentation of terrestrial habitats would result in a low transition to healthy landscapes.

Risk reduction to human life and property from wildfire in the urban/wildland interface was a key variable for assessing healthy landscapes. Alternative 1 focuses on commodity elements, Alternative 2 on commodity elements with riparian and old forest protection, and Alternative 5 on economic efficiency. This would increase fragmentation of landscape mosaics, and would not focus on fuel conditions in the interface areas or on representation of disturbance regimes appropriate to healthy landscape systems. Therefore, there would be low or no levels of risk reduction under Alternatives 1, 2,

and 5, in the short term; and in fact, it is anticipated that long-term risk under these alternatives would actually increase. In direct contrast, Alternative 4 focuses on fuel conditions in the interface areas and on representation of succession/disturbance regimes to reduce vulnerability to wildfire, resulting in high levels of wildfire risk reduction in the short and long term. Alternative 3 would have moderate and high transition levels for the short and long term, respectively. Alternative 6 would show low ability to achieve healthy landscapes in the short term, but would improve to high in the long term. In the short term under Alternative 7, current risk conditions would increase because reduced active wildfire suppression efforts would be coupled with continued increase in high-risk fuel conditions on lands near reserves. Although as wildfires reduce fuels, the long-term risk would decline and the transition to healthy landscapes would increase to a moderate rate. This would occur at a very high cost of wildfire suppression, risk to homeowners, and severity of disturbance effects.

Healthy landscape system response for ***desired human commodity values*** (such as timber products and livestock forage) is a paradox. The short-term transition to healthy landscapes with regard to commodities would be high under Alternative 1 and moderate under Alternatives 2, 3, and 4. However, because landscape relationships would become imbalanced, in the long term the availability of these commodities would decline and the trend toward healthy landscapes would drop to a moderate rate for Alternative 1 and low for Alternative 2. In the short term, Alternatives 4 and 5 would produce a moderate rate of trend toward healthy landscapes, primarily as an offshoot of restoration activities. In the long term, Alternative 4 would transition to a high rate as conditions become balanced and commodity flows are produced with only low to moderate levels of restoration. However, Alternative 5 would decline to moderate as an imbalance develops in areas with low productivity and low restoration emphasis that are adjacent to areas where commodity production is a priority. Alternative 3 is moderate in both short and long term because of moderate levels of restoration and emphasis on connectivity. Alternative 6, with a short-term low trend, would increase to a moderate level in the long term. In the short and long term, Alternative 7 would rank low in its ability to achieve healthy landscapes with regard to commodity production.

The production of ***desired human amenity values*** (such as scenic values, clean air and water, and recovery of rare habitats) in healthy landscape systems is almost directly opposite to the production of commodity values for Alternatives 1 and 2. Alternatives 3 through 7 display varying levels in ability to produce a sustainable flow of amenities. Alternatives 1 and 2 would respond with low ability to achieve healthy landscapes in the short term and would actually result in a long-term decline of amenity values. Alternative 7 would sustain moderate levels of amenity values in the short and long term. Alternatives 3, 4, and 6 would produce only a moderate flow of amenity values in the short term, because many restoration activities (such as prescribed fire, extensive thinning, and road closures) can detract from amenity values. Alternative 3 would remain moderate in the long term because of lower investment in restoration. In the long term under Alternatives 4 and 6, as more landscapes become native in appearance, high levels of amenity values would be available with only low to moderate levels of restoration.

Summary

Achieving a healthy landscape system, as measured by the 20 variables described above, is much like having a mutual fund made up of 20 stocks. At a landscape level all variables contribute to the mutual fund by improving the ability of management activities to work with the ecological tendencies (causes and effects) of landscapes. This results in ecological cause-and-effect relationships among the human, hydrologic, carbon-nutrient, food web, and evolutionary systems that maintain the complexity of native and desired non-native elements, functions, processes, and patterns. Any one of the variables (the stocks) may have little influence on landscape health (the mutual fund) when considered independently, but great influence when considered with all the other variables in the context of ecological cause-and-effect. In comparison, the rate of return on a mutual fund is exponentially higher when all variables are contributing. In contrast, if one variable is dysfunctional, it may cause an exponential decline in the combined rate of return.

The opportunity to simultaneously achieve the ecosystem management goals in Chapter 3 using the lowest long-term investment in restoration and mitigation, appears to be highest with alternatives that have landscape patterns that are becoming consistent with their biophysical succession/disturbance regimes, soil disturbance and exotic species invasion are decreasing, landscape-scale terrestrial and riparian habitats are maintained, fire risk in the wildland interface has been reduced, and commodity and amenity values are provided. Thus, Alternatives 1 and 2 would provide no or low ability overall to achieve healthy landscape systems in either the short or the long term. Alternative 3 would show moderate ability to achieve healthy landscapes in both the short and long term. Alternative 4 would have a moderate rating in the short term and a high rating in the long term. Alternative 5 would have a low ability to achieve healthy landscapes in the short or long term. Alternative 6 would have a low rating in the short term but a high rating in the long term. Alternative 7 would have low ability to achieve healthy landscapes in the short term and would show a moderate trend toward healthy landscapes in the long term.

Effects of the Alternatives on Human Uses and Values

Assumptions

The following assumptions were made by the SIT and the EIS Team:

- Production relationships were assumed as needed to translate management direction and proposed activities into outputs (also referred to as benefits) useful to conduct an effects analysis. This analysis assumed that: harvest acreage midpoints from the activity tables (tables 3-6 and 3-7) can be multiplied by simulated volume-per-acre to estimate future timber harvest amounts; that rangeland improvement, livestock management and related activities together with management direction can be used to estimate changes in livestock production; and that direction for changes in road density can be used to estimate shifts in recreation supply, which in turn can be combined with expected changes in recreation demand to estimate future recreation values. It is understood that these are broad-scale estimates used to represent the intent of alternative themes and are not supply schedules.

Summary of Key Effects and Conclusions

- Alternatives involving substantial change from current direction, especially if different from conventional management strategies, would likely be less predictable in their outcomes in the short term. In the long term, predictability would improve as experience is gained and new strategies are proven effective. Alternatives 4, 6, and 7, which emphasize restoring ecosystems by managing for more desirable and predictable disturbance regimes, would likely experience less short-term predictability in the delivery of services so that long-term predictability is improved. Alternatives 1 and 2 may be more predictable in the short term but would result in future disturbance regimes that are less predictable. Alternatives 3 and 5 may lie somewhere in between.

- Active restoration actions at the wildland-urban interface to reduce fire-related risks may increase risk of unintended disturbances in the short term. This would apply especially to Alternatives 4, 3, and 6. With successful restoration results, long-term risk in these areas should drop below current levels. However, a policy of lowering risk at the wildland-urban interface through public investments by the Forest Service and BLM may encourage more private investments and incursions in this zone, which could further increase risks to people and property.

- The current trend in livestock grazing shows a decline of 7 percent per decade. Only Alternative 5 would be expected to lessen this decline. Alternatives 2, 3, 4, and 6 would show a slight additional decline, with little difference among them. Alternative 7 would show the greatest decline because of restricted livestock grazing in reserves.

- All the alternatives would show an increase in timber volume harvested relative to the past few years. Alternatives 3 and 5 would show harvest volume greater than the combined 10-year average harvest level. Alternative 5 would show timber harvest volume greater than the combined National Forest allowable sale quantity value.

- Alternatives 3, 4, 6 and 7 would establish an extensive network of Riparian Conservation Areas (RCAs) that would likely result in a reduction in the suitable timber base and long- term sustained yield on National Forests. The extent and configuration of RCAs could also constrain operations in areas available for timber production and forest areas targeted for restoration treatments.

- Planned restoration activities would generate jobs — fewer than wood products manufacturing but more than ranching. Alternatives 4, 3, and 6 would concentrate a larger proportion of total restoration investments (and jobs) at the wildland-urban interface (generally areas with high socio-economic resiliency) than other alternatives. It is inferred that economically vulnerable areas (low socio-economic resiliency) would benefit proportionally less (in terms of jobs) under these alternatives.

- Recreation opportunities on Forest Service- and BLM-administered lands in the project area would not vary measurably by alternative, but some trends are evident. A slight shift would be expected from primitive-type use to roaded natural-type use where areas with very low road densities experience more road development. This outcome is most likely in Alternatives 1 and 5. There could be a small reduction in dispersed roaded recreation caused by road density reductions in Alternatives 3, 4, 5, and 6, with a substantial reduction in Alternative 7. There could be reduced opportunity for water-based recreation because of potential access restrictions associated with new standards for RCAs, especially in Alternatives 3 through 7.

- Changes in the economic resiliency of counties or communities resulting from implementing alternatives cannot be reliably predicted at this broad scale. The current economic vulnerability of counties can be determined and used to infer potential future effects. Areas identified as economically vulnerable (using a measure like socioeconomic resiliency) would benefit most economically from more management activities and from concentrating activities in these areas. Alternatives 1, 3, and 5 could be most responsive to this need. Economically vulnerable areas are expected to bear the most social and economic costs of changing land management strategies because they tend to be more economically reliant on employment in natural resource industries.

- Employment generated from Forest Service and BLM management use can be calculated from the estimated outputs (timber volume, livestock production, recreation value) or the amount of activity from activity tables (restoration activities), as appropriate. The former multiplies a ratio of jobs per unit of output times quantity of output, while the latter multiplies a ratio of jobs per million dollars spent times the total amount spent, assuming a constant capital-to-labor ratio.

- Alternative 1 is assumed to represent management direction in current Forest Service and BLM land-use plans. Alternative 2 is used as a second no-action alternative to provide a modified current baseline that incorporates interim direction from PACFISH and INFISH. It is assumed that Alternative 2 provides the most accurate basis for assessing the amount of change from current management predicted to result from the other alternatives. It is recognized that there are substantial differences in the management direction and implementation record among the many land-use plans currently in effect throughout the project area.
- The Social Science staff of the SIT assumed that an evaluation approach using panels made up of experts and interest groups and conducted according to Social Impact Assessment methods could provide a basis for a social effects analysis.

- The effects analysis presumes that ICBEMP standards will be followed and necessary steps taken to achieve objectives.

Causes of the Effects on Human Uses and Values

The expected outcomes or effects of implementing alternatives are estimated based primarily on the following factors:

- The vulnerability of counties and communities to adverse effects on their economic and social well-being from changes in use of Forest Service- and BLM-administered lands. Vulnerability with regard to counties is primarily assessed through a measure of socio-economic resiliency, although economic diversity and dependence on timber and rangeland resources are also employed. Vulnerability of communities is assessed through a measure of dependence of National Forest timber harvest and geographic isolation.

- The amount, type, and location of activities (tables 3-6 and 3-7) prescribed to change existing conditions to those described by the goals, objectives, and desired range of future condition (DRFC). Most important to the effects analysis are the acres of timber harvest, forest stand density reduction (thinning), prescribed fire, road management, watershed restoration, and livestock and rangeland management.

- The standards that provide specific regional direction for management prescriptions and processes where judged necessary to achieve objectives. Prescriptive standards most important to the effects analysis are those that influence timber harvest (area available and management intensity), livestock grazing, road access, and management of riparian conservation areas.

Methodology: How Effects Were Estimated

Important sources for the effects evaluation in Chapter 4 include two documents produced by the Science Integration Team (SIT): The *Evaluation of Alternatives* (Quigley, Lee, and Arbelbide 1997) and the *Assessment of Ecosystem Components* (Quigley and Arbelbide 1996). More specifically, this evaluation blends the findings of the Economics and Social Science staffs of the SIT with additional analysis and interpretation provided by the EIS Team.

Economics Science Evaluation

The SIT's Economics Staff evaluation estimated the amount and value of a set of outputs expected to be produced from the seven alternatives. Outputs included livestock produced, timber volume harvested, the value of recreation used, and the existence value of unroaded areas. Because of data limitations, unroaded values were not used in the effects

evaluation. The number of jobs generated by livestock, timber, and recreation outputs also was estimated. An analysis of economic resiliency, together with predicted employment effects, was used to address economic well-being, including predictions of changes to county economic resiliency. Economic benefits produced from the alternatives were analyzed in the context of the larger project area economy to determine the regional importance of planned outputs. A limited evaluation of the economic efficiency of alternatives was done by comparing total willingness-to-pay values for the four measured outputs. The distribution of costs and benefits also was addressed.

Social Science Evaluation

The SIT's Social Staff evaluation was based primarily on information collected through a panel process set up to support a Social Impact Analysis. Three panels were conducted. Two separate panels for the two EIS planning areas consisted of a variety of interest groups, consultants, college professors, county commissioners, sociologists, community development specialists, and State representatives. The third panel consisted of representatives from 14 tribes located in the project area. Social impact analyses are usually conducted for more site-specific projects where the scope of activities and their effects can be understood. This broad-scale plan could not provide the understanding panelists felt they needed to evaluate social effects, except in the broadest terms. Also, inadequate information about how plans would be implemented, what the economic impacts might be, and questions of the financial and operational feasibility of the alternatives, impeded attempts by the panel to estimate social effects.

EIS Team Effects Evaluation

As noted, factors used to estimate effects included objectives, standards, existing conditions, and prescribed management activities. The standards and activities deserve further elaboration because they guide management strategies and treatment priority by forest and range cluster, in effect establishing how effects on human uses and values can be interpreted. Activities were assigned to clusters according to estimates of what was needed to move from current conditions (a product of the interaction of ecological potential and management history) to the desired range of future condition. Forest and range clusters are large and include numerous Forest Service and BLM administrative units, counties, and communities. Although clusters are groups of contiguous subbasins, this is not always the ease; subbasins belonging to the same cluster may be found on opposite sides of the project area. An implication of this 'broad-scale' approach is that neither the activities nor outcomes expected to result from the activities can be 'placed' in or near a particular county or community. This means that local effects on human uses cannot be evaluated. The approach used by the EIS Team to overcome this spatial limitation was to infer potential effects of implementing alternatives from an analysis of current conditions. This approach identifies counties, communities, and occupations that may be economically or socially vulnerable to changing agency land uses. The timber and forage importance index, isolated timber dependent communities, and county social and economic resiliency measures are the types of information used to assess current economic and social vulnerability.

While aware of the spatial limitations of a broad-scale evaluation of alternatives, Alternatives 5 and 7 do offer slightly more 'place' orientation than Alternatives 3, 4, and 6 — Alternative 5 through priority use areas and Alternative 7 through designation of reserves. Alternatives 1 and 2 depart least from existing strategies, so the location of activities should be somewhat like current experience.

A set of evaluation criteria was chosen to measure how well the alternatives achieve the goals described in Chapter 3 of this Draft EIS. A set of variables considered most relevant to each evaluation criteria was used to explain and discuss effects. The choice of variables came from ICBEMP science findings, issues raised in ICBEMP scoping, and conditions described in Chapter 2.

For human uses, evaluating effects involves more than objectively measuring expected outcomes. The relative desirability of an alternative varies for each individual, interest group, or government entity depending on

personal values, occupation, economic status, and the degree to which people associate their welfare with management choices on Forest Service- and BLM-administered lands. For example, the effect of alternatives on the quality of life experienced by project area residents is expected to differ among those living in urban and growth counties compared those living in rural, isolated, and sparsely populated counties.

Effects on Annual Level of Goods and Services

All outputs were analyzed for the next ten years (the short term). Rough projections of what might be provided after 50 years (the long term) are discussed where possible. Because the Draft EIS is not spatially explicit, the effects on specific communities or counties from changing supply could not be predicted. However, inferences about county-level effects were made where reasonable. Annual supplies of benefits are averages of decade projections.

Benefits Expected from Alternatives

Measured Benefits

While 'goods and services' potentially represent a large array of priced and unpriced benefits provided from Forest Service- and BLM-administered lands three major outputs are quantified here:

- livestock animal unit months (AUMs), representing the number of domestic livestock fed on Forest Service- and BLM-administered rangelands;
- acres supplied in each of three recreation opportunity spectrum (ROS) classes, which are a proxy for the supply of 12 major types of recreation use;
- wood volume produced from timber harvest and vegetation management actions for each alternative, measured in billion board feet (bbf).

Table 4-50 displays the annual quantity of outputs and their estimated value in dollars for each alternative. Discussions that follow address how outputs were determined, the uncertainty associated with output production, and other factors relevant to interpreting effects of this production.

Unmeasured Benefits

In addition to the three measured benefits, other benefits would be provided through management activities (referred to here as 'restoration activities') designed to move current ecosystem conditions to the desired range of future condition developed for each alternative. The economic value of ecological outcomes cannot be reliably estimated, although if successfully produced they provide valuable human benefits. In the absence of an economic value for these outcomes, the restoration activities (inputs) in Table 4-51 represent intent to produce these ecological benefits. The ecological outcomes (both positive and negative) predicted from restoration are described under other subject headings in this chapter. The evaluation criteria, representing the full accounting of human goals for this Draft EIS, are the standard for judging the adequacy of these outcomes to meet human needs. In addition to ecological benefits, restoration activities also make an important human contribution through generating employment and economic activity.

Calculating Outputs

Livestock AUMs

Production Levels

Cattle production was calculated by adjusting current production according to the expected effects of implementing the objectives, standards, and land-use priorities associated with each alternative. It is expected that investments in rangeland condition could improve the amount and quality of forage available for livestock grazing in the future, although this was not modeled. Compared to total livestock production projeet area-wide (measured by AUMs), the changes projected for Forest Service- and BLM-administered lands under the seven alternatives would be very small. Even Alternative 7 would show the greatest decline in Federal AUMs in the short

Table 4-50. Measured Annual Benefits for the First Decade, UCRB Planning Area.

Outputs	Measures	1a[1]	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Livestock	AUMs	—	1,909,615	1,877,964	1,899,065	1,877,964	2,036,219	1,877,964	1,055,035
	Value ($ million)	—	18	17	18	17	19	17	10
Recreation (ROS Acres)	Primitive and Semi-Primitive	—	9,836,200	9,928,300	9,928,300	9,928,300	9,878,700	9,928,300	9,928,300
	Roaded Natural	—	7,142,400	7,050,300	7,050,300	7,050,300	7,099,900	7,050,300	7,050,300
	Urban/Rural	—	100	100	100	100	100	100	100
	Value ($ million)[2]	—	2,111	2,239	2,239	2,239	2,173	2,239	2,239
Timber[3]	Billion Board Feet	0.84	1.12	0.82	1.12	0.94	1.39	0.61	0.44
	Acres Harvested	80,500	112,500	55,000	92,500	85,000	110,000	52,500	49,000
	Value ($ million)		356	261	309	258	333	227	186

[1] Scenario 1a was added to more correctly portray management direction appropriate for Alternative 1 using 'volume offered (from TSPIRS)' instead of 'volume harvested' as used for the original Alternative 1 (which is also displayed here for reference and consistency).

[2] Total recreation value is based on projecting the amount and value of 12 types of recreation activities that occur in the three ROS categories shown above.

[3] The summed ASQ for all national forests under current land management plans in the UCRB planning area is approximately 1.35 billion board feet.

Abbreviations Used in this Table: AUM = Animal Unit Month; ROS = Recreation Opportunity Spectrum

Table 4-51. Annual Restoration/Management Activities,UCRB Planning Area

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Forest Prescribed fire (acres)	62,000	62,000	122,500	185,000	107,500	152,500	120,500
Non-commercial tree thinning (acres)	75,000	60,000	100,000	127,500	107,500	110,000	39,000
Forest road closures (miles)	241	255	651	704	327	680	687
Gated/bermed (miles)	205	115	261	211	131	340	618
Obliterated[1] (miles)	34	138	358	436	180	272	481
Decommissioned[2] (miles)	2	2	33	56	16	68	21
Rangeland road closures (miles)	100	100	100	228	100	152	228
Range prescribed fire (acres)	24,000	24,000	54,500	54,500	24,500	54,500	54,000
Livestock Mgmt[3] (acres)	50,000	147,000	147,000	260,000	147,000	260,000	83,500
Range Improvement[4] (acres)	32,000	32,000	96,000	116,500	56,000	56,000	32,000
Riparian Improvement[5] (acres)	4,000	4,000	12,000	12,000	12,000	12,000	7,000
Watershed Restoration (acres)	37,500	84,000	84,000	126,500	85,300	107,000	37,800

[1] Ripping road surfacing, seeding roadbed, and removing culverts.
[2] Reshaping of road prism to slope contour.
[3] Includes grazing system, season of use, type of livestock, herding, and deferment.
[4] Weed control, tree and brush control, fencing, and water developments.
[5] Road management, seedings and plantings, in-channel restoration, fencing, and livestock management.

term (a 50 percent decrease), would cause only a 3.5 percent reduction in the total number of AUMs produced when all livestock production in the project area is considered. Of course, ranching operations most dependent on grazing Federal range allotments would likely feel a more substantial effect from changes in Federal grazing.

As noted, the greatest change in livestock AUMs grazed on Forest Service- and BLM-administered lands would be under Alternative 7. The smallest change would be 3.5 percent decline estimated for Alternative 5. Change in AUMs grazed would differ little among Alternatives 1, 2, 3, 4, and 6, with estimated declines of 10.5, 11, 10, 11, and 11 percent respectively. Table 4-50 shows the estimated livestock AUMs produced under each alternative.

Predictability and Sustainability of Livestock Production

Although predicted changes in livestock production were drawn in part from livestock-related activities (tables 3-6 and 3-7), these activities were prescribed to improve ecosystem conditions, not to achieve a livestock production objective. Improving ecological conditions on rangelands depends more on grazing systems, season of use, and improvements than on strictly controlling the number of livestock grazed; however, changes in livestock production could result from implementing new operating standards and the rangeland restoration activities proposed in the alternatives, especially in Alternatives 3, 4, 5 and 6. New direction in Alternatives 3 through 7 would introduce additional uncertainty compared to continuation of current practices. Uncertainty could arise from changing the cost structure of private livestock operations or through questions of how agencies will implement new standards and administer (and pay for) the expanded rangeland restoration activities. Changing the way permittees use and invest in their allotments would entail substantial planning, negotiation, and administration by the agencies, potentially reducing the predictability of outcomes in the short term.

Since it is not practical to estimate the exact cost effects on livestock operators or agencies from rangeland restoration activities, a ratio of acres treated per AUM produced was calculated for the four rangeland activities by alternative (table 4-52). The ratio for Alternatives 2 through 7 were compared to Alternative 1 to represent how operator costs might increase for each alternative. This approach attempted to incorporate both increased costs and changes in production.

If short-term uncertainty for livestock operators is assumed to increase with the implementation of new standards and management activities, then the order from most to least predictable would be Alternative 1, 2, 5, 3, 7, 6, and 4. Alternative 4 would show the most change, with activity levels 2.5 to 5 times higher than existing levels. Short-term effects on the ranching industry that could result from proposed changes include: financially marginal operators departing, financially stable operators becoming marginal, and larger or more efficient operators buying out smaller or less efficient ones. In the long term, predictability for Alternatives 3 through 7 should improve as new allotment management plans are completed, rangeland conditions improve, and operators adjust to new direction.

There would be little difference in the distribution of livestock production among alternatives, other than Alternative 7, which would essentially eliminate livestock grazing in the reserves. The distribution of livestock production is relatively predictable because Federal grazing allotments are well-established. Rangeland restoration activities could lead to local redistribution of livestock grazing to different places or to grazing the same places at different times.

Recreation/ROS Acres and Scenery

ROS Acres and Predicted Recreation Use

The prediction of future recreation use on Forest Service- and BLM-administered lands, in type and dollar value, was based on the interaction of supply (represented by the number of acres in each ROS class) and demand (human population growth and demographic change). Very little change in ROS classes would be expected in the short term projected for the first decade, and change thereafter would be modest. Population growth would be the dominant factor affecting recreation uses during the next 10 years, both in type and amount. In the longer term, demographic changes (especially an aging population) will become increasingly important.

Recreation Opportunity Spectrum (ROS) is built on road access, amount of development, density of recreation users, level of facility development, and management uses. It does not account for the main attractions that draw people to recreation settings, such as water, fish, and wildlife. For ICBEMP analysis, numerous ROS classes were collapsed into three categories:

- *Primitive/semi-primitive* (primitive, semi-primitive non-motorized, and semi-primitive motorized classes)
- *Roaded natural* (roaded natural and roaded modified)
- *Rural/urban*

Recreation activities associated with the three ROS classes were grouped into 12 types, each with a different value per user day and a different projection for future use (heavily dependent on changing recreation habits of an aging population). ICBEMP scientists limited the modeling of future ROS acres to predicted changes in road density (modeled by subwatershed). The current proportion of acres in the three ROS classes for the project area is: roaded natural, 59 percent; primitive and semi-primitive, 40 percent; and rural/urban, 1 percent. Only Alternative 5 identifies areas where recreation use would be emphasized (mainly in areas already experiencing heavy recreation use).

Alternative 7 should result in the most change in recreation opportunities because it would limit recreation opportunities in reserves to mostly primitive and semi-primitive types of use. The 40 percent of Forest Service- and BLM-administered lands included in the reserves would not permit most developed and road-based recreation; areas already designated as Wilderness or that are essentially undeveloped would experience little change in recreation opportunities under Alternative 7. For the project area, there would be a very small (less than one percent) shift from recreation opportunities provided by the primitive/semi-primitive ROS class to uses associated with natural and roaded ROS

Table 4-52. Increase in Rangeland Restoration Activities Compared to Current, UCRB Planning Area

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
		Changes from Current Activity Levels[1]					
Livestock Management	Current	(x 3)	(x 3)	(x 5)	(x 3)	(x 5)	(x 3)
Range Improvement	Current	no change	(x 3)	(x 3.6)	(x 1.6)	(x 1.8)	(x 1.8)
Riparian Improvement	Current	no change	(x 3)	(x 3)	(x 3)	(x 3)	(x 3)

[1] Multiples of current activities based on a ratio of acres of activity per AUM for each type of activity.

classes in Alternatives 1 and 5, but the location of this shift cannot be determined at this scale.

There may be losses in water-based recreation stemming from extensive Riparian Conservation Areas (RCAs) and restrictive riparian management standards that imply access restrictions. Alternatives 2 and 7 would have the most strict (least flexible) approach to RCAs, followed by Alternatives 3, 4, and 6. Alternative 1 has the most flexible approach to RCAs, followed by Alternative 5.

Alternatives 3 through 7 could reduce opportunities for dispersed roaded recreation because of new standards requiring reduction of road densities. This reduction would be less likely to occur with Alternatives 1 and 2. Among Alternatives 3 through 7, Alternative 5 should show the least change, followed by Alternatives 3 and 4. Alternative 6 includes standards that would show relatively more change than Alternatives 3, 4, and 5. Alternative 7 would show the greatest reduction in dispersed roaded recreation due to limited uses allowed in reserve areas.

Potential effects of RCAs and new road management standards on recreation were modeled or predicted at this scale and would be more reliably assessed through local planning.

Predicted Changes in Scenery

The supply of scenery in the project area was measured in terms of landscape themes and degree of scenic integrity. Scenic integrity describes how 'intact' a scenic landscape is rather than whether the viewing public are likely to find the scene visually attractive or not. So while scenic integrity is not a measure of visual attractiveness, it is the closest proxy available for addressing scenery. In general, the scenic integrity of Forest Service- and BLM-administered lands in the project area is currently very good. Changes in scenic integrity predicted as a result of the alternatives are shown in table 4-53.

Timber Volume

Production Levels

Timber outputs displayed in this Draft EIS are based on a simulation of disturbance processes (including timber harvest) from which landscape effects were analyzed. The simulation was unable to exactly model the 'midpoint' harvest acres displayed in table 3-6, but results were adequate for broad-scale analysis. The simulation provided the volume-per-acre values that were multiplied times midpoint acres to get total volume.

The average National Forest System harvest acres (and volume) for the period 1985–1994 was used to calibrate the simulation harvest rate and became the basis for Alternative 1 and 2 timber outputs. It was later determined that 1985–1994 harvest volume was much higher than the timber program amounts offered for sale under current direction because harvest volume for the 1985–1994 period is inflated by past (higher) sale levels. Timber volume sold is often not immediately harvested, but 'stored' as uncut volume for some period by the purchaser. This provides the purchaser some flexibility (within the limits of the contract) to be market-responsive in their harvest decisions. A result is that annual harvest levels may be

Table 4-53. Changes in Scenic Integrity by Alternative, UCRB Planning Area.

Scenic Integrity Class	1	2	3	4	5	6	7
Very High Scenic Integrity	+	+	nc	nc	nc	+	+
High Scenic Integrity	-	-	nc	nc	-	+	+
Moderately High Scenic Integrity	-	-	-	-	-	-	-
Moderately Low Scenic Integrity	+	+	+	+	+	-	-
Low Scenic Integrity	+	+	+	+	+	nc	+

(++): Equal to or greater than a 20% increase in category acres.
(+): 0 to 19% increase in category acres.
(nc): no change.
(-): 0 to 19% decrease in category acres.
(—): Equal to or greater than a 20% decrease in category acres.

quite different than annual sale levels. Harvest rates have exceeded sales for several years as Forest Service timber sale levels have declined. Tying Alternatives 1 and 2 to this model calibration caused an overestimation of timber outputs for these alternatives, resulting in output levels too high to represent current management direction.

To be consistent with the landscape analysis, timber outputs for Alternatives 1 and 2 are still displayed here. However, timber harvest scenario '1a' were developed to better represent current timber management direction from land management plans (as amended by interim direction where applicable). This scenario was used to compare the timber volume currently offered for sale (and jobs later generated from the harvest and processing of this volume) to what would be expected under Alternatives 3 through 7.

Timber volume and jobs associated with these scenarios are displayed in tables 4-50 and 4-57 (later in this section). Jobs associated with the original timber volume estimates for these alternatives are not displayed.

Changes in Log Grades and Harvest Efficiency

Current direction in timber management, represented by Alternatives 1 and 2, stresses efficiency in harvest design compared to other alternatives. These alternatives would be more likely to implement silvicultural prescriptions that emphasize wood production, resulting in the harvest of larger diameter trees and more volume per acre than other alternatives. Even so, timber production efficiency for Alternatives 1 and 2 is well below what might be considered a maximum, since current land management plans (as amended by new direction where applicable) include stringent management direction to protect scenic, aquatic, riparian, soil, and other resource values. Current approaches already make the Forest Service and BLM high-cost producers compared to other forest landowners. Alternatives 3 through 6 would likely implement silvicultural prescriptions that emphasize restoration of more desirable stand structures, cover types, and disturbance regimes. As a result, these alternatives would generally harvest smaller diameter trees and produce less volume per acre. Alternative 7 (outside reserves) would harvest smaller diameter trees and less volume per acre than other alternatives because of standards restricting removal of large trees. The silvicultural prescriptions for timber priority areas in Alternative 5 would depart somewhat from Alternatives 3, 4, 6, and non-timber priority areas of Alternative 5 in the types of silvicultural prescriptions implemented. Timber priority areas would

likely implement prescriptions that emphasize production over restoration, but less so than would be expected with Alternatives 1 and 2.

Shifting management objectives and silvicultural prescriptions from a timber production emphasis to a restoration emphasis would change both the timber product removed from the forest and the cost of removing it. Both log size and volume per acre removed are critical to the profitability of harvest operations and lumber manufacturing. Average diameter of trees removed has been shown especially important to the financial feasibility of a timber sale. The types of silvicultural prescriptions appropriate for achieving the restoration objectives of Alternatives 3, 4, 6, and especially 7, would have a higher risk of being unprofitable (and of going unsold when offered for sale) than would Alternatives 1 and 2. Alternative 5 would lie somewhat in between. An unprofitable (unsold) timber sale would either delay the accomplishment of restoration objectives awaiting better markets for small diameter logs, or shift the restoration work from timber sales to service contracts. Service contracts would be much more costly to the agencies than timber sales where timber sales are an appropriate means to accomplish restoration objectives.

Predictability and Sustainability of Timber and Other Ecosystem Benefits

Acres of timber harvest displayed in the Draft EIS activity table (table 3-6) did not provide projections of timber volume outputs that could be interpreted as sustainable or predictable by conventional methods. The conventional way to address sustainability in forest management is through the ability to provide a regular or 'sustained' supply of timber volume in perpetuity. This traditional approach, founded in both law and policy, is part of the planning framework used by Forest Service and BLM land-use plans that include a timber component. The broad-scale landscape disturbance approach used in this Draft EIS broadens the meaning of sustainability to include all parts of the ecosystem and to account for the role of disturbance regimes in shaping how the ecosystem changes over time. With this shift, the Draft EIS did not account for the factors upon which conventional sustainability of timber supply is based. To show how the approach to predictability and sustainability change, some key differences between conventional timber planning and the landscape approach used in this Draft EIS are explained in table 4-54. Sustainability and predictability of timber benefits will be determined when the preferred alternative is incorporated into local Forest Service and BLM land-use plans.

The distribution of timber harvest volume among alternatives can best be inferred from treatment priorities described in Draft EIS standards together with the proportion of activities assigned to each forest cluster. The simulation of landscape disturbance did not specify timber harvest areas below the cluster and management region level, so the number of acres harvested were predicted, but not the location of the harvest. Evaluating how changes in timber harvest would affect particular communities or counties must await local implementation of regional strategies. A limited exception is the timber priority areas in Alternative 5 which, though broad, could permit some inferences about where timber harvest is more likely to occur.

Objectives and standards developed for Alternatives 3 through 7 would make short-term projections of future timber supply more uncertain. Most influential are those affecting riparian areas, road management, large tree retention, and unregulated harvest. The Forest Ecosystem Management Assessment Team (FEMAT) evaluation eventually led to the Northwest Forest Plan (NFP) alternatives which included similar new direction. FEMAT found that "it will be difficult in the future to achieve predictable supplies of timber from Federal lands in the owl region (Johnson et al. 1993)." The same can be said for the predictability of timber supplies from the ICBEMP project area. Although uncertainty is highest in the short term, it should improve in the long term (assuming stability in plan implementation).

Effect of Riparian Conservation Areas (RCAs) on the Long-Term Sustained Yield of Timber

The size and distribution of RCAs in Alternatives 2, 3, 4, 6, 7 and parts of Alternative 5 could substantially affect National Forest timber programs (BLM timber production is small compared to National Forest production in the project area). Potential effects would include: the amount of volume

Table 4-54. Comparison of Planning Methods in Regard to Predictability of Timber Outputs.

Projecting Timber Outputs in Conventional Planning	Projecting Timber Outputs in Broadscale Landscape Disturbance Planning, Project Area
Management intensity and timber harvest rates are based on a formal forest regulation system designed to provide predictable timber volume outputs.	Forest regulation is adapted to accommodate new landscape management approaches designed to provide more predictable landscape disturbance outcomes.
Sustained yield of wood fiber is used as a formal measure of sustainability based on the premise that a sustained yield of timber, propoerly constrained and mitigated, would sustain the underlying forest processes.	Sustained yield of wood fiber is still important, but not as a formal measure of sustainability. Sustainability is more broadly defined to account for ecosystem functions, processes, and landscape disturbance.
Assumes static ecosystems. [1]	Assumes dynamic ecosystems.
Pattern, timing and type of disturbance designed to support sustained yield of wood in perpetuity by managing the age, size, species, and development of forest growing stock.	Patter n, timing, and type of disturbance designed to support desired disturbance patterns and ecosystem processes and conditions by managing cover types and structural stages across the landscape.

[1] Conventional timber projection methods did not account for rapidly changing conditions. Changes in forest health, natural disturbance events, scientific knowledge, public preferences, and funding have undermined many assumptions used in the present timber projections. The projection of timber outputs under broadscale disturbance planning recognizes that accounting for (and being responsive to) changing conditions limits the predictability of timber outputs.

available for harvest: distribution of potential timber supply; cost of harvest and transportation; and calculation of the long-term sustained yield (LTSY) and allowable sale quantity (ASQ) required by the National Forest Management Act (NFMA) of 1976.

Forest Service and BLM timber harvest is principally of two kinds. The first kind is part of the 'sustained yield' calculation that provides LTSY and ASQ (traditional measures of what is sustainable in perpetuity). This 'scheduled harvest' is meant to be most predictable over the long term. The other kind of harvest is that harvest done for resource protection as permitted by NFMA. This is typically 'unscheduled harvest' that may be done apart from sustained yield projections. It is generally less predictable because it is more opportunistic than planned (this potentially applies to much of the restoration harvest prescribed in Alternatives 3, 4, 6 and 7 and parts of 5). The RCAs proposed in Alternatives 2 through 7 would affect both scheduled and unscheduled harvest. Effects of the interim direction described in Alternative 2 are already being experienced on the ground, but much of that direction has not yet been formally integrated into Forest Service and BLM land-use plans.

The RCAs have the potential to reduce the size of the suitable timber base and intensity of management applied to forest stands. The suitable timber base encompasses lands on which timber harvest can be regularly scheduled. This base, together with the silvicultural prescription used on these lands, are the primary determinants of long-term sustained yield volume. Thus, the effects on

potential timber outputs from implementing aquatic conservation strategies (RCAs and RMOs) derive from both the changes in land base acres and the harvest intensity prescribed on these acres. It is unknown which factor would ultimately have a greater effect on the long-term sustained yield of Forest Service and BLM administrative units. It is likely that the administrative units in the timber priority areas of Alternative 5 would be less affected than units in other areas. Administrative units with much of their land base included in Alternative 7 reserves would likely experience the most change. No attempt was made to estimate the effects of these broad-scale strategies on individual administrative units. Adjustments to long-term sustained yield will be made through land-use planning according to the National Environmental Policy Act (NEPA) and to planning regulations under NFMA and the Federal Land Policy and Management Act (FLPMA). Adjustments would vary by administrative unit based on differences in existing conditions and differences between current and new management direction.

Effect of Riparian Conservation Areas (RCAs) on Operational Feasibility

There is another factor affecting timber availability. An extensive network of RCAs (table 4-55) managed primarily to achieve riparian and aquatic objectives could in some cases render the land between these areas, otherwise part of the timber base, inoperable for commercial timber harvest (including for restoration purposes). This situation arose with the riparian reserves in the Northwest Forest Plan. It caused a reduction in the timber volume expected to be available for sale (the Northwest Forest Plan did not calculate an ASQ, but did estimate what expected harvest volume might be). The FEMAT Report (1993) concluded that "it is difficult to fully capture the impact of these new rules, especially a more extensive riparian protection network, on the area actually available for timber production." While Draft EIS riparian conservation areas offer more flexibility than Northwest Forest Plan reserves, similar difficulties can be expected. Because effects vary on a site-by-site basis, it is difficult to predict detailed effects of the RCAs at this broad scale. Also, Draft EIS standards permit modifying RCAs through ecosystem analysis or site-specific NEPA analysis (depending on the alternative) to better fit local conditions if equal or greater protection can be achieved. For this effects analysis, it is assumed that the effect of RCAs on timber outputs (and other restoration activities) would vary in proportion to the percentage of total area involved.

With more area in RCAs, it is more likely that long-term sustained yield and operational feasibility would be affected. The percentages in table 4-55 are rough averages calculated for forested lands using data from figure 4-50. The actual percent area may be less where slopes are more gentle, soil is less erosion-prone, topography is less dissected, and trees are shorter than average for the project area. The percent area may be greater where slopes are steeper, soil is more erosion-prone, topography is more dissected, and trees are taller than average. These latter conditions often describe the most productive forest sites and the areas where the effect of RCA harvest restrictions on potential timber volume outputs and operational feasibility would be greatest.

Effects on Permitted Mineral and Energy Operations

Outputs resulting from exploration and development of minerals and energy resources (such as geothermal) on Forest Service- or BLM-

Table 4-55. Total Forested Land Area Encompassed by Riparian Conservation Areas, UCRB Planning Area.

Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Percentages						
8	26	26	29	20	29	33

administered lands were not estimated. Mineral operations are generally initiated by private entities, not by the land management agencies. Broad-scale effects on mineral and energy exploration and development can only be inferred from agency management direction that may hinder potential operations.

Aquatic and riparian protection under Alternatives 2 through 6 may increase the cost of mining and energy developments by limiting the location (or requiring relocation) of mining operations and facilities (such as mill buildings, settling ponds, sanitary and solid waste structures, overburden piles). These alternatives may require relocating access roads or changing mine design and operation to avoid impacts to riparian areas. Aquatic objectives and standards in Alternatives 2 through 6 have the same potential to affect mining and energy operations.

Aquatic standards in Alternative 7 would affect transportation of chemicals used in mining. Some standards would increase transportation and storage costs to reduce risks of a spill to an insignificant level. The total prohibition on transport and storage of toxic chemicals in watersheds occupied by Federally listed threatened or endangered species would effectively eliminate many existing mining operations in large portions of the project area, including operations which have already been permitted in accordance with the Endangered Species Act.

In Alternatives 2 through 7, the projected decreases in road density or prohibition of new roads in riparian areas could result in less access and greater costs associated with mineral and energy prospecting, exploration, and development activities.

The reserves designated in Alternative 7 would result withdrawal of lands in these reserves from entry and operation under the 1872 Mining Law and the mineral leasing laws. There is currently no authority to do this. If this withdrawal were authorized, there could be substantial economic effects on mineral and energy operations as well as additional administrative burden on the Forest Service and BLM.

Effects on Utility Corridors

All alternatives share an objective to ensure that reliable and buildable utility corridors are available, now and in the future, to serve regional and local energy, communication, and transportation needs, and that essential access for energy repairs and maintenance is available. Restrictions on future siting of transportation and utility corridors are not explicitly addressed in the alternatives, although consideration for findings and direction in the 1993 Western Regional Utility Corridor Study or equivalent studies would be required in all alternatives. There is no direction in this Draft EIS indicating a substantial risk to current or future use of corridors under Alternatives 1 through 7. A related standard requires the Forest Service and BLM to maintain access to these corridors. With this requirement, it is expected that road management actions would not affect access to corridors for maintenance activities.

Effects on Long-Term Wildfire Management and Post-Fire Recovery Costs

Fire suppression and fire rehabilitation costs would likely show little, if any, decrease in the short term because of the amount of time and management action needed to substantially change landscape disturbance patterns. It could take several decades for management-induced changes in fire regimes to be evident apart from normal season-to-season variation in fire weather conditions. Over the long term, noticeable decreases in the acreage of severe wildfire and associated fire suppression and rehabilitation costs should be evident as restoration efforts lead to a progressive shift toward less severe fire regimes. Post-wildfire watershed rehabilitation costs are correlated with wildfire suppression costs, as both reflect the size and severity of wildfires.

ICBEMP scientists estimated that Alternative 7 would result in the highest suppression and rehabilitation costs, even though neither fire suppression nor post-fire rehabilitation is planned in the reserves. Alternative 7 would pose the greatest short-term risk to increasing fire-related costs because of the potential that a catastrophic fire would escape reserves and demand a very costly suppression response.

This risk is highest where reserves are established close to densely populated urban areas. Reserve boundaries could be modified to minimize this risk. An important rationale for using a reserve system is based on the assumption that in the long term, less severe fire regimes would naturally be re-established in reserves. The result should be much lower fire suppression costs in the long term. Alternatives 3 and 4 should result in the lowest cost, predicted to be approximately 50 percent of the cost of Alternative 7 over the long term. Alternatives 5 and 6 are predicted to experience approximately 60 percent of Alternative 7 costs. Alternatives 1 and 2 are predicted to be approximately 75 and 80 percent of Alternative 7 costs, respectively.

Ultimately, predicting specific long-term changes in severe wildfire acreage and the suppression and rehabilitation cost that could result is uncertain. It would depend on the complex interaction of natural disturbance processes, the intensity and location of restoration actions conducted by the Forest Service and BLM, and the management of private and other public lands in the project area. Landscape simulations suggest an aggressive and well-targeted restoration program would be less costly than relying more on natural processes as proposed in Alternative 7, or through traditional suppression strategies as proposed in Alternatives 1 and 2.

Effects of the Alternatives on National Forest System Inventoried Roadless Areas

Inventoried Roadless Areas are National Forest System lands of 5,000 acres or more characterized by their undeveloped state. The equivalent BLM roadless areas are termed Wilderness Study Areas (WSAs). Following the nationwide Roadless Area Review and Evaluation (RARE and RARE II) efforts in the 1970s, inventory of unroaded areas resulted in some Inventoried Roadless Areas being recommended for inclusion in the National Wilderness Preservation System. Congress enacted wilderness legislation for a number of areas in Oregon and Washington in 1984, prior to completion of land-use plans. No similar legislation has been enacted by Congress for Idaho and Montana, leaving unroaded areas to be allocated to a variety of uses through land-use planning. As a result, road development and resource extraction has occurred in some Inventoried Roadless Areas.

The alternatives neither prohibit nor prescribe development of Forest Service Inventoried Roadless Areas or Bureau of Land Management Wilderness Study Areas. The status of these areas remains as defined in current land-use plans. Proposed changes to the status of Inventoried Roadless Areas is appropriately addressed through the land-use planning process or through new Executive or Congressional direction. Alternative 7, because of the proposed system of reserves, is the only alternative that suggests a need to reconsider the allocation status of Inventoried Roadless Areas in land-use plans. Alternative 7 would prohibit road construction in reserves or unroaded areas greater than 1,000 acres, essentially ensuring that the unroaded character of existing Inventoried Roadless Areas would be maintained. Because current Inventoried Roadless Areas are limited to areas greater than 5,000 acres, Alternative 7 would require that unroaded areas between 1,000 and 5,000 acres be identified and mapped.

Effects of Each Alternative on Community Vitality and Resiliency

Economic effects of the alternatives would not be substantial when measured against the project area-wide regional economy. The regional economy is strong, growing, and mostly immune from changes proposed in any of the seven alternatives. Science findings noted "for most people in the Basin, expansion in other sectors means that the impact of FS/BLM decisions on their employment and income will be negligible (Haynes and Horne 1996)." This is not so for local areas, especially places that are geographically isolated from population centers and not experiencing the economic growth that characterizes the project area as a whole. This is also not so for economic sectors or individual firms that depend most on Federal land outputs, such as wood products manufacturing or ranching. While the influence of these sectors on the regional

economy is lessened by the rapid growth in other sectors, changes in Federal land uses are still important to those economically (and culturally) tied to these industries. As discussed in Chapter 2, the smallest area considered a reasonably complete 'economy' is a Bureau of Economic Analysis (BEA) trade area. The BEA economies in the project area are mostly very economically resilient and growing. A focus on these resilient regional economies misses most of the economic concerns associated with Forest Service and BLM land management, which are more local than regional. Where concerns are local, they are as much social issues as they are economic ones.

In Chapter 2, community resiliency was described as a function of population size, economic diversity, attractiveness, amenities, leadership, and the community residents' ability to work together and be proactive toward change. ICBEMP scientists added population density and lifestyle diversity as important factors, developing a measure of 'socio-economic resiliency' for project area counties (table 4-56). In general, Forest Service and BLM land-use decisions have little influence on the factors important to community resiliency. The agencies also have no mandate to set goals for changing community resiliency. However, the Forest Service and BLM can have a role in helping communities achieve their economic goals, which may include economic diversification. Alternatives 3 through 7 include objectives for this purpose.

ICBEMP scientists made an effort to predict how the economic resiliency (diversity) of counties could change for the seven alternatives, but the results were weak. At this broad scale, projections could not account for most factors needed to predict changes in economic resiliency caused by the alternatives. Effects were predicted by using an assessment of current socio-economic resiliency (adaptability to change) to predict where economic vitality (well-being) might be at risk from changes proposed in the seven alternatives. The dependence of isolated rural communities on National Forest System timber also entered into this approach. The concept of vulnerability is used here as a comprehensive means of addressing how counties or communities might be affected by the alternatives. The discussion of vulnerability is preceded by a discussion of the employment generated by Forest Service and BLM land uses in the project area.

Employment

ICBEMP scientists compared the number of jobs generated from Forest Service and BLM-administered lands to the total number of jobs in the project area (Haynes and Horne 1996). Estimates of Forest Service and BLM-generated jobs were made for four employment sectors: recreation, wood products manufacturing, ranching, and mining. Scientists also estimated the economic importance of wood products manufacturing, ranching, and mining from all sources to the regional economy as a whole. As of 1990, Forest Service- and BLM-administered lands contributed approximately 240,000 jobs to the economy of the project area, or 16 percent the area-wide total of 1,500,000 jobs. Recreation provided by these public lands contributed about 225,600 of these jobs (15 percent of area-wide total jobs), mostly from hunting, motor viewing and day use. Wood products manufacturing, ranching and mining jobs generated from Forest Service- and BLM-administered lands accounted for a combined 14,400 jobs (1 percent of project area-wide jobs). Total employment in wood products manufacturing, ranching and mining from all producers combine to account for only 4 percent of total project area employment. The SIT found that no alternative would change the number of jobs generated from Forest Service- or BLM-administered lands by more 0.1 percent project area-wide.

ICBEMP scientists drew three main conclusions from their findings:

- Recreation use generates far more jobs than other uses of Forest Service- and BLM-administered lands.
- The prosperity of the regional economy, as measured by total employment, is not dependent on employment levels in the timber, livestock, and mining industries. Scientists refer to this as the 'decoupling' of regional economic performance from the manufacturing sector, attributable to rapid growth in non-manufacturing sectors of the economy.
- Timber, livestock and mining jobs, although a small part of total regional employment,

Table 4-56. Socioeconomic Resiliency Rating System, Project Area.

Population Density (persons per square miles)	Economic Diversity	Lifestyle Diversity	Composite Rating	Number of Counties
Very Low (<6)	L, M	L	L	44
Low (6> x < 11)	L, M	L	L	10
Medium (11 > x < 33)	M, H	M, H	M	20
Medium-High (x > 33)	H	M, H	H	26

Abbreviations used in this table:
L = Low
M = Medium
H = High

Source: From *Integrated Scientific Assesment* (Quigley, Graham, and Haynes, 1996)

make up a larger portion of total employment in some communities and counties. Changes in outputs from Forest Service- and BLM-administered lands can have substantial economic and social effects in these areas.

These conclusions suggest that differences in Forest Service- and BLM-generated employment among the seven alternatives are very small relative to total employment in the project area. The number of jobs estimated to be generated from Forest Service and BLM management activities for the seven alternatives is shown in table 4-57.

There has been some controversy over how ICBEMP scientists calculated job numbers with regard to the relative contribution to project area employment among timber, ranching, mining, and recreation-related industries. It has been asserted that calculation of timber, ranching, and mining employment included only direct employment, whereas calculation of recreation jobs included both direct and indirect employment. The intent of ICBEMP scientists was to measure only direct employment for all sectors, but unlike the timber, ranching and mining industries, direct employment data for recreation is not available. Recreation employment must be distilled from employment in several other sectors, generating the concern that both direct and indirect employment is included. The issue is that the contribution of jobs from the timber and ranching industries are understated relative to the recreation industry. It has also been argued that since jobs in these industries generally pay higher wages than jobs associated with recreation, their economic contribution is

Table 4-57. Estimated Number of Jobs Generated by Forest Service and BLM Activities, UCRB Planning Area.

Alternative	1	2	3	4	5	6	7
Wood Products Manufacturing	6,636	6,400	8,750	7,350	10,800	4,750	3,400
Restoration and Analysis	1,704	1,490	2,640	2,685	2,960	1,885	1,170
Ranching	687	676	684	676	733	676	380
Recreation	113,400	119,300	119,300	119,300	116,400	119,300	119,300

This table is based on Annual Productions for the first decade.

[1] Jobs in Wood Products manufacturing for Alternative 1 are based on Timber Scenarios Scenario 1a as described in the Effects on Human Uses and Values Section and Table 4-50.

more significant when measured by income than when measured by employment. A discussion of wages in Chapter 2 of this document supports this position.

Economically Vulnerable Areas

Areas that appear to be economically vulnerable to changes in the management of Forest Service- and BLM-administered lands have been identified. A number of ways to measure vulnerability (discussed in Chapter 2 of this document, in the *Assessment of Ecosystem Components* [Quigley and Arbelbide 1996] were developed, and the *Integrated Assessment* [Quigley, Graham, and Haynes 1996]). In general, most measures indicate vulnerability in areas that are sparsely populated, distant from metropolitan areas, not economically diverse, and not experiencing much economic growth. Of these measures, the socio-economic resiliency index (map 4-1), timber dependent communities (table 4-58), and counties receiving Federal revenue sharing in excess of PILT (map 4-2) combine to represent areas economically vulnerable to changing management direction on Forest Service- and BLM-administered lands.

Socio-economic resiliency (a composite of population density, economic diversity, and lifestyle diversity) is a measure of adaptability to change. It does not describe current community vitality or well-being, which may be good even where resiliency is low. The premise of the 'vulnerability approach' is that changes can result in loss of jobs and county revenues that are not readily made up elsewhere.

Of particular concern is the vulnerability of sparsely populated counties whose ability to support infrastructure and social services can be affected by how Forest Service- and BLM-administered lands are used. These so-called 'frontier counties' (44 in the project area) may lack sufficient population to finance needed services now or in the future. They are not expected to share much in the population growth projected for the project area as a whole. All of these 44 counties are among the 54 determined to have low socio-economic resiliency.

Judging the relative economic effects of the alternatives on people raises a dilemma — whether the number of people affected or number of counties affected should be more heavily weighed. Most of the project area population (83 percent) lives in 46 counties that have medium or high socioeconomic resiliency. Thus, if socioeconomic resiliency is used as an indicator, a relatively small proportion of the project area population is likely to feel economic and social consequences from Forest Service and BLM land-use choices. Only 17 percent of the project area population live in counties with low socioeconomic resiliency (figure 4-51). However, this 17 percent lives in 54 counties, each with a responsibility to deliver social services and maintain the public infrastructure (figure 4-52). While the number of people potentially affected may be relatively small, the number of county governments potentially affected is large.

Socioeconomic resiliency, although considered a reasonable indicator of vulnerability at this broad scale, is not a direct measure of potential effects. Effects still depend on how the costs and benefits of changing Forest Service and BLM land uses are distributed across the project area.

Table 4-58. Isolated Timber-Dependent Communities, Project Area.

Oregon	Washington	Idaho	Montana
Lakeview, Paisley, John Day, Long Creek, Mt. Vernon, Prairie City, Burns, Heppner-Kinzua	Colville, Ione, Kettle Falls, Republic	Kamiah, Kooskia, Weippe, Elk City, Grangeville, Bonners Ferry, Moyie Springs, Council, New Meadows	Darby, Eureka, Fortine, Rexford, Trout Creek, Seely Lake, Superior, Thompson Falls

Source: Assessment of Ecosystem Components in the Interior Columbia Basin Including Portions of the Klamath and Great Basins (Quigley and Arbelbide 1996).

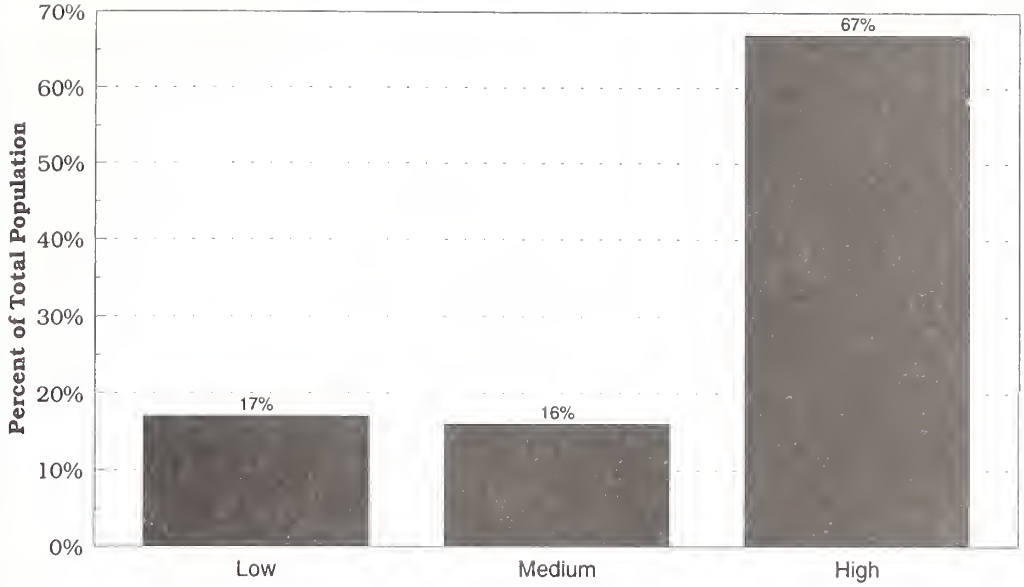


Figure 4-51. Socioeconomic Resiliency, Percent of Population, Project Area.

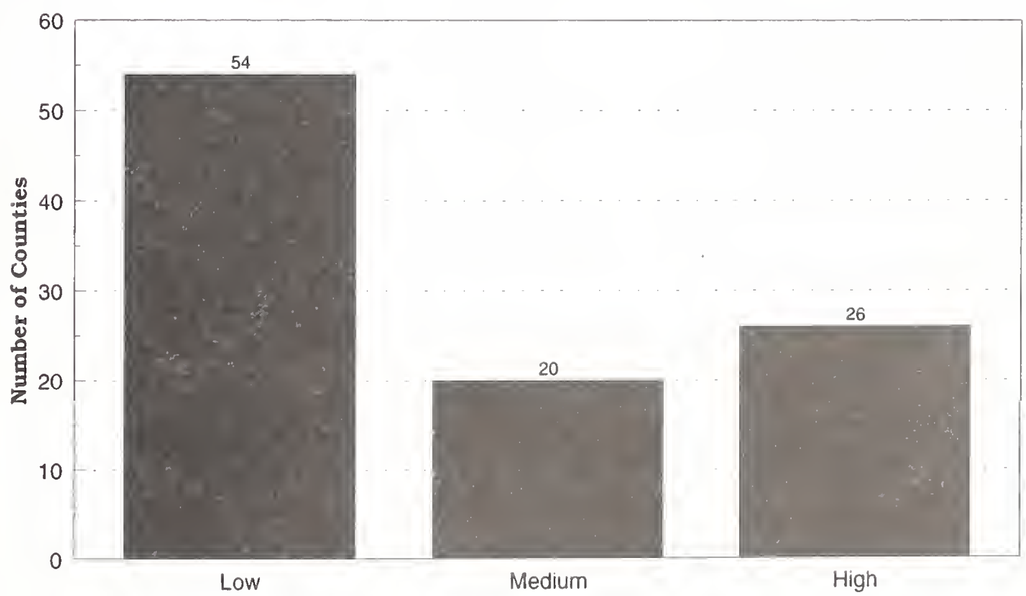
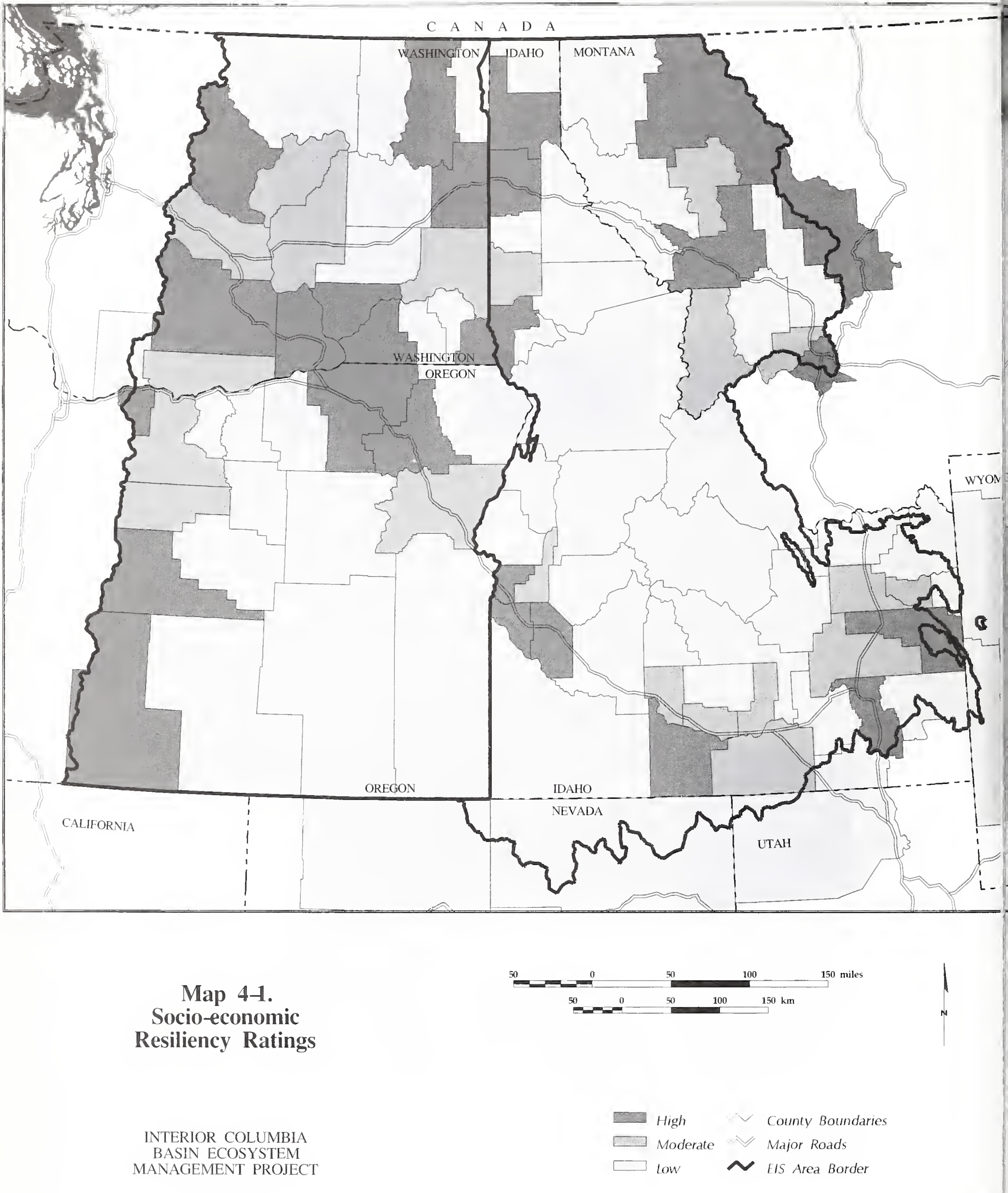


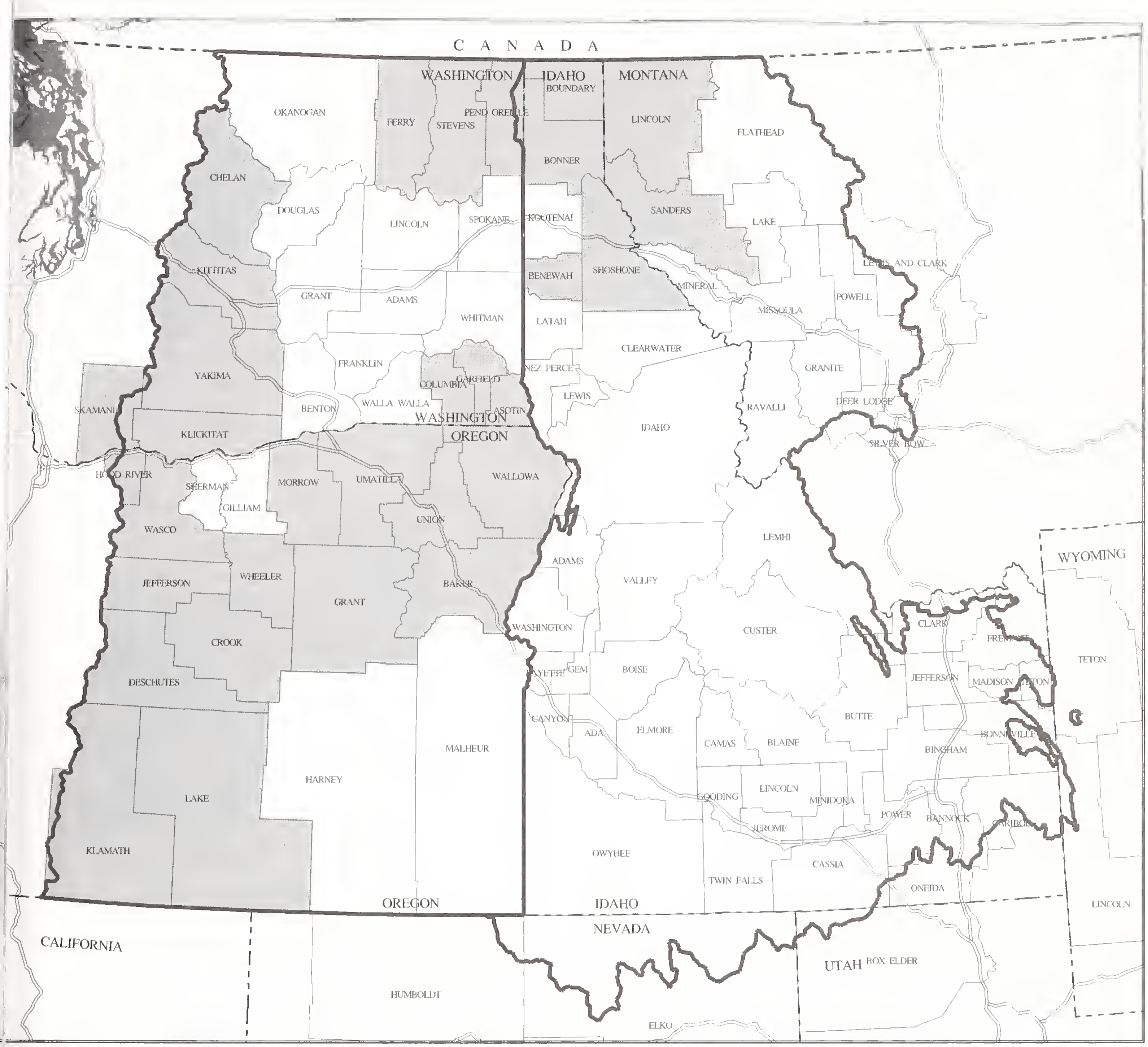
Figure 4-52. County Socioeconomic Resiliency, Number of Counties by Rating, Project Area.



Map 4-1. Socio-economic Resiliency Ratings

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Project Area
1996



Map 4-2. Counties Receiving Payments from Federal Timber Harvest in Excess of Payment in Lieu of Taxes, 1992

50 0 50 100 150 miles

50 0 50 100 150 km

N

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996

County Boundaries
Major Roads
EIS Area Border

Source: Schmidt 1995

Investing in Vulnerable Areas or the Wildland-Urban Interface

An objective common to Alternatives 3 through 7 is to reduce the risk of catastrophic events (especially fire) at the wildland-urban interface. This objective serves two purposes: (1) to reduce risk to people and property at the urban-wildland interface, while simultaneously reducing the trend toward difficult urban fire suppression by land management agencies; (2) to create a low risk 'buffer' around populated areas so that restoration activities in the interior can be conducted with less risk that unintended fire or smoke events will spread to the interface. Another (and potentially conflicting) objective common to these alternatives is to support economically vulnerable areas.

Balancing achievement of these objectives means setting priorities and recognizing the trade-offs. Areas where wildfire risk to humans is highest, if measured by the number of people and structures at risk, are the areas that least need the economic benefits of restoration-generated employment. These areas tend to have the highest socio-economic resiliency and rates of economic growth. Sparsely populated areas that have fewer people and structures at risk tend to have lower socio-economic resiliency. These areas would gain the most economic benefit from agency restoration expenditures.

In evaluating the alternatives, ICBEMP scientists assumed that Alternatives 4, 3 and 6 would concentrate a larger proportion of total restoration investments at the wildland-urban interface compared to the other alternatives. It can be inferred that economically vulnerable areas would benefit proportionally less under these alternatives. Furthermore, reducing risk for those living at the wildland-urban interface through active management of wildlands can act as an incentive to encourage further development in these zones. The effect could be to decrease the risk on the wildland side while increasing the risk on the urban side.

Areas with High Risk at the Wildland-Urban Interface

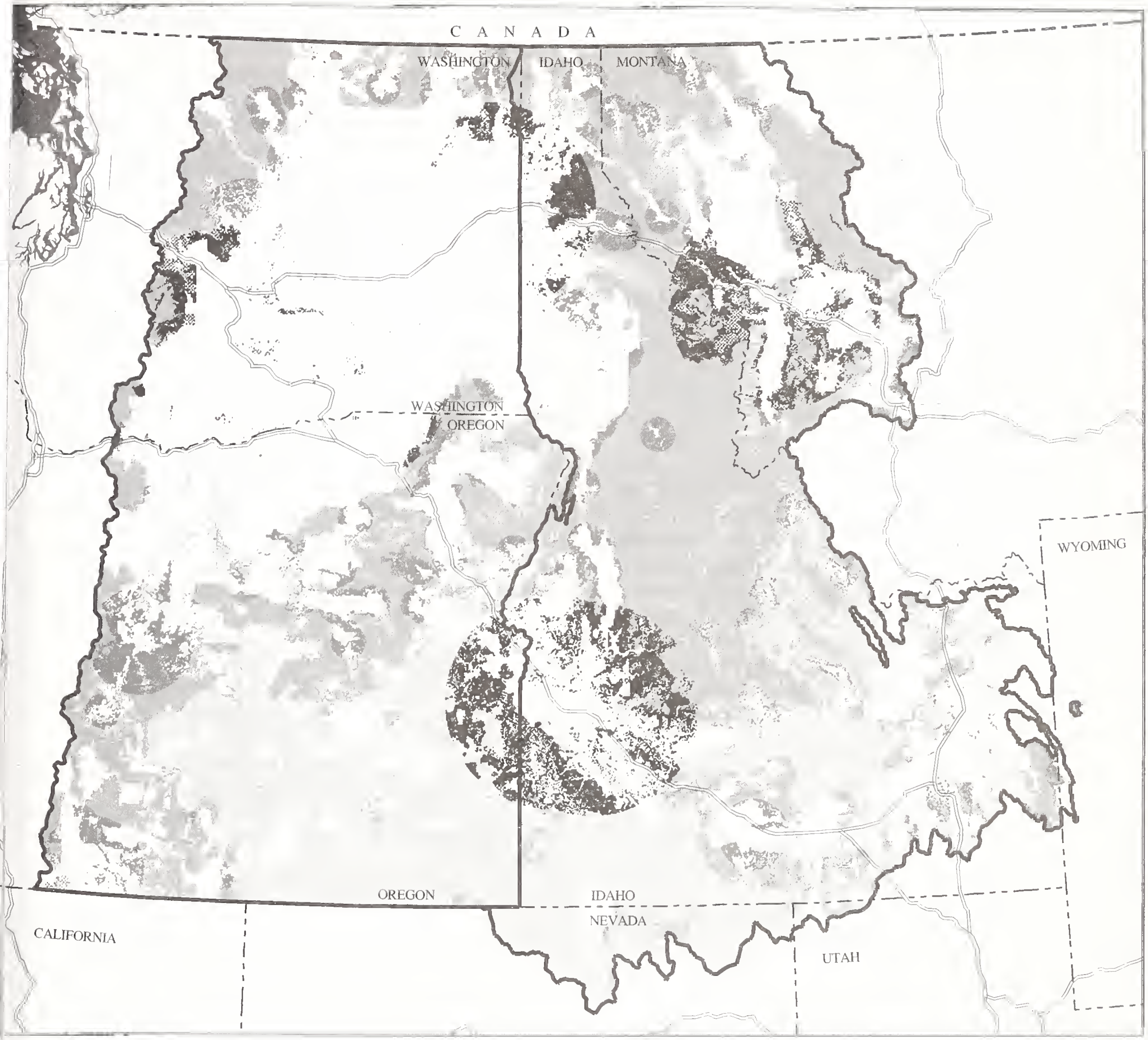
The Science Integration Team classified areas according to risk of human ecological interaction (risk to human life and/or property from ecological restoration activities and risks to ecological integrity from human activities) (Map 4-3). This classification would presumably be used to set management priorities for reducing risk at the wildland-urban interface. Areas identified as having *very high risk of human ecological interaction* include: the Boise/Nampa/Ontario Interstate 84 corridor; the Coeur d'Alene, Idaho area; the Missoula and Kalispel, Montana commuting areas, and around Phillipsburg, Montana. Both the socioeconomic resiliency and economic diversity of these areas are generally high or medium. Of these areas, only the far edges of the Missoula commuting area correspond to isolated timber-dependent communities.

Areas identified as having *high risk of human ecological interaction* include: around Ione and Republic, Washington; the Highway 95 corridor south of Grangeville, Idaho; around Orofino, Twin Falls, Bonners Ferry and Island Park, Idaho; and around Libby and Fortine, Montana. Many of these areas lie in counties with high or medium socioeconomic resiliency and economic diversity. Some do not. The communities of Republic, Ione, Fortine, Grangeville, Bonners Ferry, and Orofino were identified as isolated and timber dependent. These areas would presumably benefit from restoration activities in Alternatives 4, 3, and 6 meant to reduce risk of wildfire.

Rate of Implementation

Adverse effects on economically vulnerable areas could result from alternatives designed to have a slower rates of implementation or if implementation is slower than planned. Slow or delayed implementation postpones the benefits derived from activities. Possible reasons for a slow rate of implementation or unexpected delays include new standards for pre-project ecosystem analysis and new standards for collaboration with tribes, governments, Resource Advisory Councils (RACs), and public interests. How these standards would affect the rate of implementation once a plan was approved is difficult to predict because it depends on the location , amount, and distribution of activities.

Regarding pre-project Ecosystem Analysis at the Watershed Scale, the percent of area requiring analysis (which varies by alternatives, see table 4-59) does not indicate how much would actually be conducted during the next 10



Map 4-3. Risk of Human Ecological Interaction

BLM and Forest Service Administered Lands Only

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT

Project Area
1996

years for two reasons. First, it is not known whether activities would be proposed in areas requiring analysis or in less sensitive areas where ecosystem analysis is not required. Second, it is not known whether activities would be concentrated in fewer watersheds (less analysis) or widely dispersed over many watersheds (more analysis). Alternatives 1 and 2 do not require ecosystem analysis. Alternatives 3 through 7 do require it, but with different timing. Alternatives 7 (outside reserves), 5, and 4 encourage rapid initiation of restoration actions early in the decade. Alternatives 3 and 6 encourage ecosystem analysis early in the decade, delaying some of the restoration actions to later in the decade. Alternative 6 has the additional requirement of completing all subbasin review in the first year. From a risk perspective, it could be said that Alternatives 7, 5, and 4 would take the position that the risks associated with delaying the achievement of anticipated ecological, social, and economic benefits (pending more analysis) are greater than the benefits of additional up-front analysis, at least in the short term. Alternatives 3 and 6 take the opposite position. It is assumed that short-term up-front investments in ecosystem analysis (and slower initiation of activities) in Alternatives 3 and 6 would be rewarded with faster and more effective implementation of activities in the long term. Alternative 7 could experience another source of delay—the difficult task of setting up the reserves. Considerable study and debate about final reserve boundaries can be expected.

A slow rate of implementation of timber harvest activities could especially be cause for concern. Slow or delayed initiation of activities, on top of changes in the timber programs experienced since 1990, could pose potential cumulative effects on the wood products industry and counties whose budgets depend on revenues derived from Federal timber sales. For example, in the UCRB planning area, the timber sale program fell from 1.0 billion board feet (bbf) in 1990 to 290 mmbf in 1994. All alternatives would show a first decade increase in timber volume harvested compared to the past few years (figure 4-53). Firms and workers in the wood products industry that have persevered through recent declines could be permanently affected by slow initiation of activities for those alternatives that would show a first decade increase in timber volume. Temporary mill closures and layoffs can become permanent, resulting in a departure of labor and capital from some rural communities. This may be an inevitable cost of a long-term change in management strategy; however, such losses would represent an unintended consequence of the alternatives if they resulted from a short-term delay in implementing a strategy that would otherwise avoid this outcome. Of course, mill closures and job losses can occur even with rapid implementation if new management direction shifts harvest out of a mill's supply area (assuming alternative timber sources are not available).

Table 4-59. Area Requiring Ecosystem Analysis at the Watershed Scale in the First Decade, UCRB Planning Area.

Alternative	1	2	3	4	5	6[1]	7
		Percentage of Forest Service- and BLM-administered land where Ecosystem Analysis would be required prior to conducting activities.					
Forest Service/BLM	0	0	42	29	20	71	19
Forest Service	0	0	60	41	30	81	22
BLM	0	0	8	6	1	51	12

The actual area requiring Ecosystem Analysis for Alternatives 3 through 7 could be less if activities would not affect species/habitats noted in Standard EM-S8. See Standards EM-S7, S8, S9, and S10 in Table 3-5.

[1] Alternative 6 does not include the large blocks of native rangeland area where Ecosystem Analysis is required under standard EM-S10.

Public Participation and Collaboration

Alternatives 3 through 7 include several objectives meant to improve the participation of tribes, State and county government, Federal agencies, Resource Advisory Councils, and public interest groups in the planning, implementation, and monitoring of land management strategies and activities. Some of these objectives refer to helping communities achieve their economic goals. Some refer to improving efficiency in the delivery of goods and services from Forest Service- and BLM-administered lands. Most of these objectives could probably be achieved through current management direction in Alternatives 1 and 2. However, instituting additional direction in Alternatives 3 through 7 should improve agency effectiveness at public participation and responsiveness to public needs. The objectives would not change the different values people hold, but they should improve understanding among the competing interests and improve the public acceptance of management strategies so that plans can be implemented with more consistency and predictability.

Effects on Quality of Life of Project Area Residents

Understanding Quality of Life

Quality of life is characterized by an array of factors, many of which are not directly

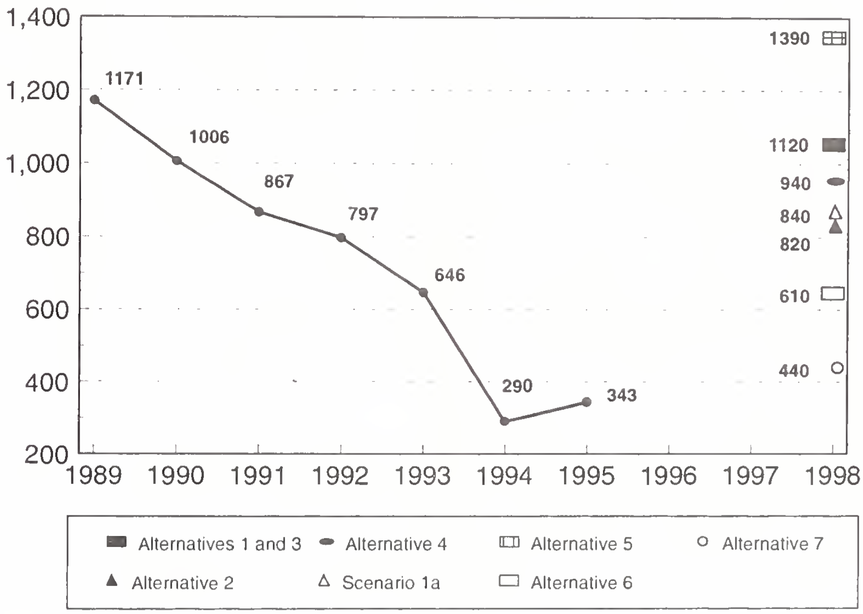


Figure 4-53. Timber Volume Offered, Historical and by Alternative, UCRB Planning Area National Forests.

influenced by Forest Service and BLM management decisions. Factors include an area's economic diversity, scenic beauty, crime rate, levels of income and employment, employment security, environmental risk (pollution, health hazards, natural disaster), voting rates, infrastructure, medical care, education, and commercial services. The relative importance of these factors differs for each individual depending on his or her personal values, occupation, economic status, and other factors. Quality of life refers to the satisfaction people feel for the place they live and for the place they occupy as part of it. There is no one comprehensive way to measure how the alternatives affect the quality of life of project area residents. As with most change, some people would receive a disproportionate share of the benefits while others would bear a disproportionate share of the costs. Accordingly, some may feel their quality of life would improve while others may feel a decline. In order to address how residents of the project area may perceive their quality-of-life change as a result of the proposed alternatives, a few very generalized viewpoints are used for illustration. Viewpoints are offered for two categories of project area residents and two categories of project area counties. As with any generalization, exceptions are easy to find, but these viewpoints reflect the major concerns raised in the scoping process and the issues frequently voiced at public meetings held throughout the project area.

Different Viewpoints on Quality of Life

Individuals

Population growth and demographic change is the most powerful source of change in the project area. Neither population nor demographics is influenced by alternatives (or by Federal land management in general). These changes are, however, quite important in shaping public preferences on how public lands should be managed. Population growth, especially from in-migration, causes shifts in economic, political, and social power.

Rural Residents with Traditional Lifestyles

Population growth and demographic change can be troubling to people whose sense of place, social status, or economic well-being is grounded in traditional occupations and lifestyles. This is relevant to public land uses because the economic opportunities and traditional lifestyles for this group are often closely tied to nearby Federal lands and to resource industries. People and communities hoping to preserve these traditional lifestyles look to Federal land managers to make land-use choices that support the lifestyles they value (and that appear threatened by new people, new values, and new money). They appreciate and support efforts to improve ecosystem conditions and reduce environmental risk, but often feel they bear most of the social and economic consequences of trading off commodity production for more ecosystem benefits. They generally feel that a less costly trade-off can be found. For these people, the preference order among alternatives might be Alternatives 5, 3, 4, 1, 2, 6, and 7. Alternatives 1, 2, and 5 would have less restrictive standards, inferring more local flexibility. Alternatives 1, 3, 4, and 5 would have relatively higher output levels. Alternative 7 would likely be seen as too restrictive and unpredictable. The preference order presumes that timber harvest and livestock grazing can coexist with improved protection of environmental values, and that local flexibility may be the best way to accomplish this.

Urban and Newer Rural Residents

For others, population growth and demographic change is adding to their quality of life. For most people in the project area, economic prosperity does not depend on the amount of timber or livestock produced from Forest Service- and BLM-administered lands. Most jobs are found in other sectors. Lumber and meat are readily available at reasonable prices regardless of production levels on agency lands. Growth in rural communities provides improved cultural amenities and economic services that enrich their enjoyment of small town living in the highly scenic western landscape. Many people bring with them outside sources of income not directly tied to the land, and often their relationship to the land is different than that of long-time residents. This is relevant to public land uses because these people value the surrounding Federal lands more for scenic, recreation, and aesthetic values. They look to Federal managers to make land-use choices that do not compromise these values. From this perspective, quality of life is best served by

a departure from traditional land uses like logging, livestock grazing, and mining. Preferences among the alternatives would likely hinge on reducing the undesirable effects of these uses. Lower production and strict operating standards may be the preferred approach. From this perspective, the order of preference for some people might be Alternatives 6, 2, 4, 3, 5, 7, and 1, based in part on activity levels and in part on a preference for more detailed standards perceived to lessen risk to environmental values. Alternatives 3, 4, 6, and 7 offer more of these detailed standards. Alternatives 2, 6, and 7 would have relatively lower activity levels. Alternatives 1, 4, and 7 would carry an additional element of uncertainty, though each for different reasons: Alternative 4 may appear too aggressive, Alternative 7 may seem too restrictive and risky, and Alternative 1 has an unreliable implementation history. Trading off commodity production for less environmental risk and greater ecological benefits may seem a good option since few consequences would be experienced.

County Government

Rural and Frontier Counties

Some county commissioners are concerned about their ability to provide social services and support infrastructure when budgets grow tighter, due in part to reductions in revenue-sharing from the Federal lands within their counties. Economists share this concern, especially for sparsely populated counties with low economic resiliency. Some counties are experiencing increases in social distress, caused in part by employment losses in the forest products industry. This distress comes at a time when county budgets are least able to cope with the increased need for social services. Whether or not employment losses stem from changes in Federal land use, these counties look to Federal land managers to make land-use choices that help soften the effects of the changes they are experiencing.

To these counties, the most important quality-of-life issue may be providing adequate services to their citizens. While a majority of counties in the project area probably fit this category to some degree, only a small share of the total project area population lives here. Alternative 5 might be most favored by this category because timber and livestock priority areas overlap many of the most economically vulnerable counties. Alternatives 2 and 3 might follow in preference. Alternative 4 is potentially favorable because of high activity levels, but it is uncertain what proportion of these activities will be concentrated around high-risk urban areas versus in the less populated counties. Alternative 6 would be similar to but less favorable than Alternative 4. Alternative 1, as current direction, has proven unreliable and is generally not likely to be favored. Alternative 7 is unlikely to be favored.

Metro and Growth Counties

For metro and growth counties, the challenge is not adapting to job losses but managing rapid growth. These counties are generally economically diverse and resilient and becoming more so. These counties might look to Federal land managers to make land-use choices that reduce the risk of wildfire and smoke to their growing population. To these counties, the most important quality-of-life issue might be the safety of their citizens at the wildland-urban interface and the desire to maintain or enhance the amenity values thought important to continued economic prosperity. While a minority of counties are in this category, a large share of the project area population lives here. This category is likely to favor Alternatives 4 and 6 because those alternatives emphasize aggressive risk reduction at the wildland-urban interface and aggressive restoration in general. This assumes people would accept higher short-term risk from prescribed fire, logging, and other restoration activities near populated areas so that long-term risk is reduced. For those not tolerant of higher short-term risk, Alternatives 2 and 3 might be most attractive. Alternative 5 may be relatively less attractive in the timber and livestock priority areas, but attractive elsewhere. Alternative 1 would involve more risk from wildfire and more risk to aesthetic values from traditional management, and may be less favored for this reason. Alternative 7 would likely be least favored because of the high risk of catastrophic natural events. Some high growth, economically resilient counties might desire to sustain traditional lifestyles and occupations even though these lifestyles and occupations are not important to their economic well-being. These counties might view Alternatives 2 through 6 roughly the same, recognizing that the trade-offs are counter-balancing.

These example scenarios show the differences in how people and governments perceive quality of life and the role of Federal lands in supporting it. Most would agree that everybody's quality of life benefits from improved ecosystem conditions and lower environmental risk. Disagreement arises over who bears the costs and if the trade-offs are fair and necessary. People who count their loss of lifestyle or livelihood as the cost of improved ecosystems may feel a decrease in their quality of life. People who do not bear any direct cost for increased ecosystem benefits are likely to feel their quality of life has improved as a result of management that produces these benefits.

Risk and Uncertainty

Long-Term Predictability

The long-term predictability of outcomes is influenced by at least three major factors. First is the likelihood that natural systems will behave as expected. It is thought that ecological systems with more predictable and less extreme disturbance regimes will provide for more predictable human uses. A consequence of managing for more predictable disturbance regimes in the long term is that short-term predictability is likely to suffer. Secondly, a land-use strategy that is more responsive to social values (particularly where written into law, as with the Endangered Species Act) has a better chance of being implemented as planned, conferring a higher predictability for human uses. Third, land-use strategies that can be implemented at a cost reasonably in line with historical funding levels are more likely to be funded, providing goods and services for human use as projected in the plan.

Short-Term Predictability

In the short term, predictability is mostly a function of how much a new management strategy departs from what is known, especially from knowledge gained through personal and/ or documented experience. Given that Alternatives 3 through 7 include fundamentally new management strategies, both in methods and desired outcomes, short-term uncertainty seems greatest for these alternatives. Detailed standards have been included to varying degrees in Alternatives 3 through 7 in an attempt to solidify processes for achieving desired outcomes. While this may provide some short-term confidence in implementation, there is insufficient experience with this new landscape disturbance approach to confidently predict that outcomes will be exactly as predicted. Alternatives 3, 4, 6, and 7 also entail risk of escaped prescribed fire, unintended smoke pollution, or scenic degradation resulting from active vegetation management, timber harvest, and prescribed fire at the populated wildland-urban interface. Alternative 3 includes additional uncertainty because of inability to predict how the 'local emphasis' would be implemented. Alternative 5 should offer comparably more certainty because 'priority areas' offer more clarity in management priority and include standards that give managers more flexibility to apply local knowledge, perhaps improving the predictability of outcomes. A potential long-term risk from more local flexibility may be inadequate consideration of landscape-scale conditions. Alternative 7 offers comparative certainty in the management of reserve allocations, but much uncertainty about what will happen to these reserves when left to natural disturbance processes. Alternative 1, built on the premise that sustained yield of timber would sustain the underlying forest processes, was designed to offer a high degree of predictability in the supply of timber. With a rejection of this premise, Alternative 1 is no longer thought very predictable. Alternative 2 might offer the most certainty if interim direction provides for legal compliance. The agencies also have some experience with Alternative 2, so predictability is a little higher. This discussion is limited to comparative predictability of outcomes, not their comparative desirability.

Effects of the Alternatives on American Indians

Assumptions

The following major assumptions were made by the Science Integration Team (SIT) during their evaluation of alternatives:

- ◆Tribal involvement in decision-making will provide needed cultural information and tribal feedback and will ensure the success of actions (meaningful consultation, protection of treaty reserved rights) under each alternative.

- ◆Protection and/or restoration of habitats and ecosystems by the BLM or Forest Service will provide an important part of the biological requirements of healthy and sustainable ethno-habitats (socially and/or traditionally important habitats). The identification, understanding, and protection of ethno-habitats in consultation with affected tribes will provide for the cultural needs of ethno-habitats. Considering both biological and cultural components of ethno-habitats in land use planning and management will help to provide for healthy, sustainable, and useable habitats.

- ◆The presence of culturally significant species within evaluated habitats will be used as an index of success in meeting responsibilities to protect trust resources, cultural uses, and habitats (ethno-habitats included).

- ◆Many commonalities exist between Indians and non-Indians in areas of social, economic, political, and Federal land managing concerns and needs.

Summary of Key Effects and Conclusions

- ◆Generally, Alternatives 3, 4, 6, and 7 would provide the best response to agency need for appropriate levels of government-to-government consultation (see table 4-60). This is expected given that Alternatives 1 and 2 would not address the inconsistencies in tribal consultation between agency units or emphasize a more effective consultation process as found in Alternatives 3 through 7. Also, Alternatives 5 and 7 would limit opportunities for consultation and access to agency policy-making by providing up-front structure to management decisions through identified priority or reserve areas. Alternatives 4, 6, and 7 appear to be most responsive to Federal trust responsibilties and tribal rights and interests, as these alternatives would provide highest levels of habitat consideration for trust resources.

- ◆Alternative 5 would provide fewer opportunities for collaboration or consultation with tribes (table 4-60) because it makes decisions for management emphasis on different areas across the project area.

- ◆Alternatives 3, 4, 6, and 7 would be most responsive to those issues of interest to tribes (table 4-61). This includes provisions for ethno-habitats and for culturally significant places and resources in management decisions. The collective reasons for this are based on how these alternatives would provide for: (a) a meaningful agency-tribal consultation process; (b) projections of ecological integrity trends; and (c) overall aquatic and terrestrial projections of identified tribal interest species' habitats rated for viability concerns.

- ◆Tribes share an over-riding concern and interest for healthy functioning ecosystems in the project areas, and for land management that would provide biophysical trends toward their socially desired range of future condition (Table 4-62). Those alternatives that appear most responsive to such federal trust responsibilities and tribal rights and interests are Alternatives 3, 4, 6, and 7 as they would provide the highest levels of consideration for major ecosystem components, such as aquatic integrity; rangeland and forestland regulation processes, patterns, functions and structures; and hydrologic systems.

- ◆The alternatives differ in the rate and degree at which trends in ecological integrity would occur due to a combination of factors including: (a) differing rates in application of aquatic and riparian habitat protections as found in Alternatives 2 through 7 and especially Alternatives 3, 4, 6, and 7; (b) method of land management activities; and (c) the primary factors contributing to composite ecological integrity and landscape ecology trends (see the Composite Ecological Integrity section). These would benefit most under Alternatives 3, 4, 6, and 7.

◆ American Indian peoples, who have long occupied the project area, possess cultures, concerns, and needs that vary from those of the general public.

◆ Although tribes have individual identities and relationships with the U.S. Government, there are some common interests and concerns, which may be affected by the alternatives.

◆ Key issues, held by most tribes, could be used by the SIT as criteria to evaluate the effects of the alternatives on the tribes.

◆ A panel session specific to tribes was an adequate approach to provide a social SIT evaluation of the alternatives' effects on American Indian tribes.

Discussion: Those interests used to develop this section (that is, interests that were discussed during the tribal panel and those raised in ICBEMP meetings with tribes) should be understood to be an artificial collapsing of project area-wide tribal issues and concerns. In fact, the tribal panel resisted the process used in their meetings to identify seven criteria for evaluating EIS alternatives. Thus, the very way tribal issues are displayed and currently understood is perhaps best seen as a beginning point for future agency-tribal relations.

◆ Federal agencies' legal authority to carry out trust responsibilities to tribes extends beyond strict legal obligations.

◆ Assumptions identified in other subject areas concerning ecosystem health are also applicable to the American Indian tribes' evaluation.

The following assumptions were made by the EIS Team:

◆ Each tribe represents a sovereign government dependent upon the U.S. Government to protect and promote its individual right to self-determination. American Indian tribes have interests and legal rights that must be considered by BLM and Forest Service agencies in the project area regardless of whether the tribes are federally recognized through treaties or executive orders. Those tribes that have had their Federal recognition terminated in the past and later reinstated often continue reserved treaty rights and/or legal resource interests, such as water rights in old reservation/allotment lands.

◆ Each tribe has separate areas of interest (see Appendix C). Each tribe has rights and/or interests in fishing, hunting, gathering, and livestock grazing on off-reservation public lands. Tribal involvement at broad policy levels is just as significant as at site-specific levels in order to protect tribal rights and interests, which are a baseline for examination of Federal trust responsibilities to tribes. Pre-existing rights reserved through treaties or executive orders, and rights to self-determination (including social well-being), have varying legal obligations for agencies. Agencies have responsibilities to restore habitats that have been degraded.

◆ Both the tribal panel and many comments from tribal representatives suggest there exists an intrinsic set of relationships between the cultural uses, water-land well-being, and social well-being subject areas, without real conceptual boundaries. An assumption was made that much of the ICBEMP's various functional approaches would parallel primary tribal interest and help build toward an evaluation of effects on tribal trust resources, assets, and interests. (This is explained in the Effects on American Indians/Tribes, later in this chapter). Consequently, the four American Indian subject subsections are interrelated and dependent on the findings of the other subject areas, especially Landscape Ecology, Aquatics, and Terrestrial.

Causes of Effects on American Indians/Tribes

The causes of the effects of the alternatives on American Indians and tribes were differentiated between those effects that were the result of general historical to current trends for all alternatives, and those that would be the result

of management actions from one or more of the alternatives. Causes of effects include the following:

- Significant long-term historical trends away from natural ecosystem processes, loss of habitat integrity and/or connectivity for some species of cultural significance (ethno-habitats included), decreases in fine-scale biodiversity, and increases in broad-scale ecosystem homogeneity (that is, losses in dynamic and resilient ecosystems to the extent that they adversely affect American Indians and their socio-cultural systems).

- Vacillation in Federal Government policies toward tribes from a cultural assimilation to political and cultural integrity philosophies.

- Encroachment of American society on American Indian/tribal rights and land-based interests. This has affected the cultural integrity of tribes and traditional communities and caused losses in access to culturally significant species, useable/ sustainable species levels, healthy habitat conditions, ecosystem health, and place integrity.

- Lack of acknowledgment of tribes' legal standing and rights or needed involvement in policy and management activities.

- Agencies' lack of understanding of American Indian cultures, interests, issues, needs, value systems, or organizational structures.

- No consistent approach to tribal-agency relations and agency units. A history of few or no Federal agency policies until recently to address the many Federal legal responsibilities and American Indian/tribal interests.

- No emphasis on a multi-scale management strategy to address tribal rights, interests, or concerns (for example, no multi-scale prioritization of tribes' culturally significant habitats in agency planning/policies).

- Forest Service and BLM use of NEPA project planning timelines to drive dialogue between tribes and agencies in tribal consultation activities, to the extent of limiting mid- and broad-scale approaches to agency-tribal relations and resolution of fine-scale tribal issues

- Tribal concerns for the agency decision-makers' accountability and effects of their actions, due to a scarcity of cooperative agency-tribe experiences working toward shared goals, and to differences in organizational interests/directions and a general lack of trust between tribes and agencies.

- Movement of agency personnel for promotion and advancement, which tends to maintain agency-tribal relationships in the early stages of development.

- Insufficient funding to allow the tribes to participate in this process to the extent they wished.

- Disagreement between tribes and Federal agencies regarding the nature of the Federal trust role on off-reservation public lands.

Methodology: How Effects on American Indians/Tribes were Estimated

Evaluation Methods for Habitat Trends

To examine effects on culturally significant resources and tribal assets, a general listing of known species of tribal interest was created. Because tribes have maintained a proprietary interest in certain resources and places, which may also have cultural (including spiritual) significance to a tribe, disclosure of this information would breach confidentiality. To a degree, this limited the information available to the SIT and their evaluation. However, there was sufficient information to provide a broad-scale analysis of identified species along with a preliminary evaluation of the alternatives' effects on tribal interests.

A set of project area-wide culturally significant species was identified using both anthropological literature and input from a few tribes. From this preliminary effort to identify species, approximately 190 plant species, 70

animal species, and 35 aquatic species (biased toward fish species) were identified as having historical or current use. This constituted a list of "tribal interest" species for this project. Recognition is made that this species listing is preliminary, drawn from scientific literature for purely analytical purposes, not specific to a particular tribe or tribal area of interest, and not strongly founded in tribal consultation. However, it was considered an adequate effort to begin identifying those species groupings and habitats for habitat trend analysis in order to inform basin tribes about habitat conditions and general trends. Such information was considered necessary to address habitats of traditionally/socially importance (ethno-habitats) and species population trends issues.

The list of culturally significant species was then reviewed to identify "core" species of importance, for the sole purpose of narrowing the list to a manageable number that could be analyzed. The core list of species of tribal interest was then matched to a list of known species viability concerns. Aquatic species included 7 salmonids and 18 other narrowly endemic and sensitive fish with viability concerns and of potential tribal interest. A total of 70 terrestrial species of tribal interest were recognized, of which 9 had associated viability concerns. For plants of tribal interest, 86 species were identified as a "core" selected group of species to be considered, and one was found to have a viability concern. These 35 species of identified tribal interest were examined for habitat trends through viability panel assessments (SIT Terrestrial and Aquatic reports).

In addition to species viability assessments, all 70 wildlife species of identified tribal interest were examined for general trends in habitat conditions (see Table 2-30 in Chapter 2). Although intended only to provide an indication of habitat trends, some inferences are made as to how responsive alternatives might be over the 100-year period.

Estimation of Effects on American Indians/Tribes

A social evaluation of the EIS alternatives was conducted by use of three social panels, one for representatives of affected American Indian tribes, one for the Eastside EIS, and one for the UCRB EIS. The American Indian tribal panel was composed of representatives from 14 affected tribes representing interest in both EIS areas. (See the Social SIT evaluation report for more information on the panels.)

The methods used on assess effects to American Indian tribes are primarily qualitative and based on selecting key indicator variables and emphasis areas on which tribal issues appear to focus. Those important emphasis areas are generally weighted toward healthy ecosystems and useable/accessible ethno-habitats, integrity of culturally important places and provisions for cultural uses, cultural survival, and social needs. These topics were then used to identify SIT evaluation information in terms of the following:

- Landscape ecology conditions that are stable/resilient over time, and/or trends toward the historical range of conditions;
- Aquatic and terrestrial conditions, habitat trends, and species populations trends where there are viability concerns;
- Healthy, sustainable, and useable habitats (including ethno-habitats) and culturally significant species populations without viability concerns for tribal needs; and
- Social-economic conditions or trends that paralleled or addressed components of agency-tribal relations, and social and water-land well being.

Effects of the Alternatives on American Indians/Tribes

In addition to the information provided in the previous section on Human Uses and Values, this section describes the effects of the alternatives on the American Indian tribes and communities in the region and their traditional lifeways. Background information for this section has been derived from a long-term and ongoing dialogue with the many affected tribes and Indian communities involved in the Interior Columbia Basin Ecosystem Management Project. Since December 1993, tribal liaison staff of the ICBEMP have initiated many staff-to-staff meetings with all affected tribes and

several government-to-government meetings between agency decision-makers and tribal councils. Other sources of information include the *Evaluation of Alternatives* (Quigley et al. 1997). review comments, written submissions provided by tribal representatives, an understanding of the tribal issues described by Hanes (1995), and the seven primary issues taken from tribal panel discussions (Birchfield et al. 1996). Four topic areas based on tribal issues and concerns are used here to describe the alternative effects on American Indians/ tribes: (1) agency-tribal relations; (2) cultural uses; (3) water-land well-being; and (4) social well-being.

Agency-Tribal Relations

The basis for Federal agency relations with tribes is derived from the U.S. Government's special relationship with American Indian peoples and tribal governments, along with Federal common law jurisprudence forms. Federally recognized tribes are sovereigns that have special legal status and relations with the U. S. Government; however, Federal agencies are also responsible to both to American Indians and tribes through the direction provided by all three branches of the Federal government. Congress has adopted laws and policies that acknowledge and promote tribal self-determination and the social-well being of tribes and their members. (See chapter 2, section on American Indians.)

A tribal panel reviewed the alternatives and their associated direction and identified a general distinction between Alternatives 1 and 2 and Alternatives 3 through 7 (table 4-60).

Table 4-60 shows a relative ranking of 1, 2, or 3 to indicate a range from most to least, respectively, on how accessible tribes would be to policy and project decision processes, based on qualitative information and the description of the alternative. This chart provides a qualitative ranking of alternatives based on two primary subject areas of tribal-BLM/Forest Service agency relations:

- To provide a *relative ranking for effective consultation*, the following were considered: the relative degree that alternatives would allow for consistency in inter-agency, region-wide consultation policies/ guidelines; and tribal government access to agency decision-making elements.

- To provide a *relative ranking of effects on resources and lands associated with contemporary Indian interests*, a qualitative assessment was made as to how alternatives: (a) would allow for the continued exercise of tribal treaty reserved rights to hunt, fish, gather, trap, and graze livestock to be exercised; (b) would provide water quality/quantity and access to trust, traditional, or treaty resources and assets, and (c) would implement levels of activities displayed in tables 3-6 and 3-7 (Chapter 3).

Currently both the BLM and Forest Service have or are developing national policy guidance covering each agency's responsibilities for consultation with federally recognized tribes. Such direction is general and would apply to the respective agencies for all alternatives. The effect of Alternative 1 is that it would promote existing inconsistencies in agency approaches to consultation practiced by the various BLM or Forest Service administrative units. Alternative

Table 4-60. Relative Effects on Agency-Tribal Relations, Project Area.

	Alternatives						
	1	2	3	4	5	6	7
Effective Consultation	3	3	1	1	2	1	2
Tribal Rights and Interests	3	3	2	1	3	1	1

1 = most accessible to policy and project decision processes
3 = least accessible to policy and project decision processes

2 may provide greater incentives for agency units to establish dialogue with tribes, but it also would not provide for consistencies in consultation practices between agencies, agency units, or regional groupings of agency units.

Under existing BLM and Forest Service regional guidance and land-use plans, management actions addressing the Federal Government-to-government relationship with tribes under Alternatives 1 and 2 have little and/or varying direction to address Federal legal responsibilities toward tribes. Also, these alternatives largely are a reflection of historical and current direction. When dialogue does occur between agencies and tribes, it is typically within the context of agency business and the NEPA process rather than being a government-to-government driven dialogue process. Agency expectations for responses to their inquiries within specified regulatory time frames, which legally apply only to Federal agencies, maintain stress on agency-tribe relations.

In addition, there would continue tobe little direct respresentation of affected tribes' perspectives within agency organizations, since few American Indians with a cultural or tribal affiliation background from the project area work in the Forest Service or BLM.

Alternatives 1 and 2 would not provide for a program approach to agency-tribe relations at administrative unit levels. However, Alternatives 3 through 7 recommend use of tribal liaisons or liaison functions, to help meet the intent of effective consultation. These alternatives also are expected to bring about enhanced agency-tribe relations through effective approaches in communication and an emphasis on a balance of agency policy, program, and project level participation of tribes.

These factors, along with past organizational barriers to shared financial and cooperative work activities, may become increasingly significant as tribal governments continue to take on responsibilities previously performed by the Bureau of Indian Affairs. This may be especially true of the Shoshone-Pauite Tribes of the Duck Valley Reservation, which adopted the provisions of the Self Governance Act of 1975, and the Confederated Salish and Kootenai Tribes of the Flathead Reservation, which adopted the provisions of the expanded Self Governance Act of 1994. (This act authorizes interested tribes to, among other things, become more involved in public land management activities, such as grazing, forestry, and recreation. Self-governance is essentially an expansion of self-determination policies, extended to all Department of Interior's programs in off-reservation settings.)

Alternatives 3 through 7 provide for more effective consultation processes based on an approach to identify, understand, and work toward resolving conflicts through a relationship characterized by on-going dialogue between agencies and tribes. As time passes and relations are developed on the basis of effective consultation, and as habitat trends access and conditions are addressed, it is expected that agency-tribal relations will improve. If effective consultation occurs concurrent with NEPA-driven processes and also outside of such legislative act processes as intended under Alternatives 3 through 7, this should cause fewer posturing actions/ statements, project appeals, and lower risk of vulnerability to Federal legal responsibilities.

Alternatives 3 through 7 would also enhance the development of a tribal self-governance program and more effectively support tribal self-determination than Alternatives 1 and 2. This same group of alternatives would direct both agencies to uniformly develop meaningful ongoing relationships with affected tribes and include American Indian communities. The objective TI-O1 and its companion standards and guidelines direct the BLM and Forest Service to develop dialogue with affected tribes/ communities. The only distinctions among alternatives are seen in guidelines, which are suggested techniques developed specific to either the EIS area or to the first two alternatives.

Alternative 5 and 7 both place limits on opportunities for consultation and access of Indian peoples to agency policy making, as a result of up-front structure to management decisions through identified priority or reserve areas. Alternative 5 has management priority areas, which were developed with a focus other than tribal interest and concerns for cultural uses and social-economic needs. Alternative 5 additionally places tribes and their collective needs in more contrasting relationships with the BLM and Forest Service than they have traditionally experienced, given management

emphasis across the project area. This could result in greater differences in how tribes perceive the agencies' management, and could create a greater distinction in how tribes attempt to focus their relationships with agency units and seek issue resolutions. Alternative 7 designates reserves that restrict tribes' involvement in the decisions for and use of those areas in the future.

Cultural Uses

American Indians' cultural uses of the project area typically have a basis in their individual cultural traditions and seasonal subsistence patterns, which sustained bands and their cultural systems through thousands of years. These traditional cultural practices were project area-wide, and even a sample seasonal round would cross through a wide range of landscapes (see Chapter 2). Even contemporary cultural practices potentially involve acquisition or use of hundreds of species and use of numerous ethno-habitat types by a traditional user over a period of a year. Traditional uses considered here include Indian peoples' sacred values and uses of the landscape and cultural places.

Access is a critical factor to American Indian peoples with regard to a wide variety of issues, including cultural practices such as harvests of resources, values and uses of sacred areas/ places, and cultural survival through passing knowledge between generations. The presence of healthy and sustainable populations of culturally significant species at ethno-habitats is not sufficient if access to such familiar habitat areas is precluded by physical barriers, socio-cultural restrictions or change in land ownership.

Alternative 7 poses some limitations of access within in reserves that may restrict the full range of Indian cultural uses despite an agency understanding that reserved rights to habitats and resources must be permitted or addressed through a consultation process with affected tribes and communities (table 4-61). However, effects on the integrity or quality of these same places may be adverse to tribal rights and interests. Alternatives 3 through 7, and especially 4 and 6, may limit access in some areas where roads may be reduced or use restricted. In the case of Alternative 4, this limitation may be beneficial to tribal interests.

Because of the strong connection of cultural uses to water-land well-being, some of the discussion relevant to hunting, fishing, gathering, trapping, and livestock grazing is examined in this subsection.

Table 4-61 elements were rated relative to each alternative using a 1, 2, or 3 to indicate a range of most to least able, respectively, to benefit the tribal issues/rights to access, places, and ethno-habitat protection. The latter category is weighted toward fishing and hunting because more information at this broad analysis scale is available concerning associated habitat trends as compared to gathering activities.

This table attempts to identify some key elements of American Indian cultural uses as they are relevant to alternatives' directions and management actions; alternative direction for an effective consultation process; constraints on tribal access to both ethno-habitats and other socio-cultural places; and issues similar to those used to address the Quality of Life topic. (See table 4-60 and the Human Uses and Values section.) The ranking of access by alternatives takes into consideration both access to decision making and changes in road densities. The protection of places considers access, integrity of setting, and the elements of agency-tribal relations.

The cultural significance of many American Indian places is often based on socio-cultural values and related to multiple cultural systems. Thus, a place may derive its cultural meaning and value from more than one cultural system (religious, economic, political, and/or social), and its significance is often based on more than on important past events or a small group experience(s).

The importance of sharing cultural experiences, values, and information between generations, and the significance of these activities for tribal cultural survival, are at the heart of tribal issues of access to culturally significant places and resources. Provisions of road access were considered in Chapter 3 through standards and objectives. Allowance for American Indian elders with regard to access to places (including ethno-habitats) has implications for tribal cultural survival and other areas of individual tribal social well-being and tribal sovereignty.

Table 4-61. Relative Effects on Cultural Uses, Project Area.

	Alternatives						
	1	2	3	4	5	6	7
Access	1	2	1	1	1	2	3
Places	3	2	1	1	2	1	1
Ethno-habitats useability	3	2	2	2	3	1	1

1 = most able to benefit tribal issues and rights to access, places, and ethno-habitat protection.
3 = least able to benefit tribal issues and rights to access, places, and ethno-habitat protection.

Alternatives 1 and 2 recognize the importance of places to American Indians through implementation of existing laws such as the National Historic Preservation Act and regional policies. Alternatives 3 through 7 would provide similar direction, but it is designed to be achieved through the consultation process with tribes and to recognize place attachments across unit and agency boundaries. The effect is expected to help bring about greater sensitivity toward and incorporation of tribal interests in agency land management.

Water-Land Well-Being

Water-land well-being refers to tribal perceptions and values of water, water systems, and the land (including natural ecosystems and their components and processes), and reflects the recognition of their interrelationships (ecosystems). Indian people and their tribal governments are interested in the overall condition and health of the Northwest region's environment as well as in their respective homelands. These concerns are often expressed in terms of a tribe's area of interest, where people have traditionally lived and practiced land-based lifeways.

The continued importance of these lifeway patterns is reflected in gathering activities, religious practices, and place attachments specific to sites, landforms, and environment/ habitat types. All aspects of ecosystems including water, soils, habitats, species groupings, landscape conditions, and air are viewed as interconnected through the collective socio-cultural values of each individual tribe. The tribal panel expressed greater concern for a "water-land" subject area, in comparison to such issues as economic opportunity.

There is some difficulty in describing effects on tribes and/or Indian communities, which stem from Federal agencies' actions on ecosystems and culturally significant species and habitats. It requires understanding differences between the desired range of future conditions (DRFC) in context of tribal needs and rights, and the historical range of variability as a base line for understanding trends in habitat conditions. The project has an imprecise understanding of how tribal governments' might characterize appropriate desired conditions in light of the ecosystem's current capabilities. However, the distance between the project's DRFCs and the natural range of variability is thought to be greater than those desired by some tribal governments, especially in the area of overall ecosystem integrity and aquatic system values.

Water

The concerns and issues involving water are broad and related to a host of tribal rights, social-economic needs, cultural uses, and property interests. Tribal governments are especially concerned about water quality and quantity, hydrologic functions, aquatic systems' integrity, and soil integrity within the ecosystem. This section addresses the first two aspects of tribes' water concerns.

Water quantity issues were not directly addressed by the science team owing to the

fine-scale nature of the issue. Thus, many of the specific outcomes of interest to Indian people concerning lakes, streams, rivers, riparian areas, and wetlands and their relationships to systems and processes that support habitats and species will need to be addressed through discussions at the site-specific analysis and multiple-scale management levels. Alternatives 4 and 6 would offer more flexibility within riparian and wetland habitats than Alternative 7, by permitting restoration, conservation, and those production activities that would not be expected to degrade habitat conditions. Consequently, these alternatives would both place risks on riparian and wetland habitats as well as provide more provisions to improve degraded habitat conditions. Alternative 7 would assist these water-dependent habitats largely through restrictions of human actions in aquatic systems.

Although the Science Integration Team was unable to address water quality directly, a potential indicator of project area-wide water quality is suggested by cold water fish habitat trends and the varying overall protection for aquatic resources provided in each alternative. The SIT evaluation of cold water fish suggest Alternatives 1 and 5 followed by Alternative 2 would have a decrease in aquatic habitat trends. Alternatives 3, 4, 6, and 7 are predicted to have a slight increase in the same trend and are thus expected to help respond to the water quality and aquatic system concerns of American Indians/tribes. (See the aquatics section of this chapter.)

Hydrologic Functions

The tribal concerns that agencies contribute to healthy functioning hydrologic systems would be best addressed in Alternatives 3, 4, 6, and 7, and poorly addressed in Alternatives 1 and 2. The slope provisions in Alternatives 4 and 6 (Zones 1, 2a, and 2b) would provide additional protection not found in Alternatives 3 and 7. Alternative 7, however, was designed to include the greatest watershed, riparian, and aquatic protection and includes most of the major components of the five-step coarse screening process advocated by some mid-Columbia River tribes and the Columbia River Tribal Fish Commission. Alternative 5 in aquatic emphasis areas is expected to benefit higher elevation forested riparian habitats. However, timber priority areas, which would use less protective standards, are not anticipated to show the same level of benefits.

Relative values for tribes would be a combination of the most protective measures found in Alternatives 4, 6, and 7. Most affected tribes would likely want to use an intergovernmental strategy to reduce the downward trends in aquatic systems and their functions from historical conditions and to seek ways to benefit culturally significant aquatic species. Effective consultation and cooperative relationships with all northwest federal regulatory agencies and federal and state land managing agencies would be a necessary element. (See the Physical and Aquatics sections of this chapter for more detailed discussions.)

Soil

The relative ranking of alternatives for soil protection, maintenance, and restoration suggests how tribes would be affected. (If soil integrity is high, ecosystems benefit, which positively affects tribes.) Overall, Alternatives 3, 4, and 6 would most likely restore, maintain, and protect soil productivity and function. Alternatives 5 and 7 could restore and protect soil productivity. Alternatives 1 and 2 would not meet soil productivity and function goals and objectives. See the Soils portion of the Physical section of this chapter for more details.

Air

The BLM and Forest Service are responsible to consider their management effects on Indian land airsheds. Tribal government concerns for clean air, much like those for other project area communities, are largely centered on wildfire air emissions, which may occur in concentrations hazardous to human health for limited time periods. These concerns are largely fine-scale assessment issues and would be unaffected by any proposed alternatives. In general, tribes are supportive of prescribed burning programs, especially if they would benefit ethno-habitats, and have not taken issue with related smoke emissions. (See relevant discussions in the Physical Effects/Air and Human Uses and Values sections concerning urban interface wildfire information.)

The Flathead and Spokane Reservations, at tribal government requests, have been zoned as Class 1 airsheds and therefore maintain higher standards under the Clean Air Act for management and protection. Both of these tribe_s governments monitor their own air sheds and work cooperatively with State EPA regulatory offices. Federal land managing agencies coordinate with these tribes to help ensure those standards.

Habitats and Species Groupings

The tribes' interest in culturally significant species is addressed in terms of species with viability concerns and how habitat trends are affected by alternatives. Three species categories are discussed (aquatic, and terrestrial animal and plant species), based on SIT's findings. (See this chapter's subject discussions on Aquatics, Terrestrial, and Physical Effects.)

One of the four initial major terrestrial goals was to address long-term harvestability goals for plants and animals given Federal agencies_responsibilities to tribes and needs to implementing resource protection strategies for species of identified tribal rights and interest. The overall degree that a given alternative provides for the long-term viability of native plants and animals on BLM- or Forest Service-administered lands was considered the best currently available indicator of the harvestable potential for culturally significant species_ habitats. The science team reported these habitat trends and identified a set of species considered to have viability concerns. (See Appendices C and K.)

Aquatic Species

Tribes are greatly concerned over a number of aquatic issues including the disparity between current aquatic systems and the desired range of future condition; extensive losses in aquatic systems' integrity; and viability concerns or problems surrounding a majority of identified species of tribal interest. Many of these same species have played integral roles in the Northwest region's native cultures. The loss of harvestable levels of some species and available/sustainable ethno-habitats for these and many others have affected cultural change in Indian communities through effects to their economies, social well being, cultural integrity, religious practices, socio-cultural values, and quality of life.

Most aquatic species evaluated by the SIT are identified as tribal species. Thus, the trends projected for the alternatives as reported in the Aquatics section of this chapter provide an approximate correlation to how well alternatives would respond to the aquatic concerns of tribes.

All alternatives have goals, objectives and standards pertaining to the protection of riparian areas and wetlands in expectation that such protection would benefit aquatic systems. The SIT's evaluation of aquatic systems and resources linked the predicted outcomes in fish distributions and status through predictions of management action influences on habitats given the current patterns of fish distribution and road density.

Resident Native Salmonids

Alternatives 1 and 5 would result in a continued decline of resident native species populations due to inadequate protection or restoration of riparian and aquatic ecological processes. Alternatives 6 and 7 would conserve most core population areas and move toward restoration of degraded habitat and improve status of resident native salmonids. Results for Alternatives 2, 3, and 4 vary by species. Refer to the Aquatics section for further information.

Anadromous fish

Alternatives 3, 4, 6, and 7 are expected to conserve most remaining habitat and move toward restoration of degraded habitats for steelhead, stream-type chinook, and Pacific lamprey, with the greatest potential for improvement under Alternative 6. Alternatives 1 and 5 would benefit some core areas, but overall population declines would continue. It is predicted that none of the alternatives would provide for habitat needs of ocean-type chinook salmon, manage perceived threats, or ensure persistence of the populations. Alternatives 6 and 7 have the most conservative approach to conserving and restoring riparian areas/ watersheds, and may have some benefit to ocean-type chinook if actions tend to improve agency-administered land's water quality and

quantity. None of the alternatives address the needs and opportunities for restoring habitat conditions on other land ownerships, or provide a comprehensive restoration approach for steelhead, stream-type chinook, or ocean-type chinook.

Narrow Endemic and Sensitive Fish

Under Alternatives 1 and 5, conditions would continue to decline due to high levels of timber and grazing uses and low stream/riparian protection measures. Alternatives 2 and 3 would show relative improvement of habitat conditions due to greater protections and increased watershed and riparian restoration emphasis. Alternatives 4 and 6 would provide a further relative improvement of habitat conditions due to decreased livestock grazing impacts and higher riparian/watershed restoration. Alternative 7 would provide the greatest relative habitat improvements due to greater habitat protection measures and more restrictions on land-disturbing actions.

The most protective measures and positive trends for aquatic integrity are anticipated from Alternatives 4, 6, and 7. Alternative 6 would likely provide the greatest protection and the least aquatic integrity risks from restoration activities as compared to Alternative 4.

Alternative 7 may achieve similar results to Alternatives 4 and 6, but in the long-term, risks associated with a lack of a restoration emphasis for vegetation and watershed management would lessen its ability to achieve the overall effect of the other two alternatives. Alternative 2 with its relatively high aquatic protection standards, (PACFISH and INFISH) is expected to have positive effects on aquatic integrity, but lacks an integrated ecosystem approach and a restoration emphasis.

Terrestrial Animals and Plants

Animals

The Science Integration Team identified 70 terrestrial vertebrates species of tribal interest: 35 mammals, 33 birds, and 2 reptiles. For those 17 tribes with government headquarters and/or reservations within the project area, 67 vertebrate species of identified tribal interest were analyzed by comparing historical vegetation cover types and structural stages to the current vegetation eondition. These vertebrate species were not listed for a specific tribe; therefore, all species' habitat conditions were analyzed for all 17 tribes (project area-wide) regardless of whether or not the species range overlapped a specific tribal area of interest.

Decreasing trends in potentially suitable environments from historical to current were exhibited by 42 species (63 percent) of the vertebrate species. Some species increased in some tribal areas of interest based on changes in potential suitable habitat, while the same species decreased in others based on habitat changes. While this does not provide an indication as to how the proposed alternatives may affect species either the short or long term, it does suggest impacts on tribal interests from the historical to current on these selected species' habitat conditions.

Only 9 of the 70 terrestrial vertebrates (13 percent) were rated by the terrestrial panels. Of these, the Columbian sharp-tailed grouse, Californian bighorn sheep, and grizzly bear would have the greatest reductions in habitat conditions and population, but would remain unaffected by alternatives since these species are more affected by adverse factors from non-agency management sources. Concerns for bald eagle habitat trends would be reversed under Alternatives 3, 4, and 6. Antelope and sage grouse habitats would respond best under Alternatives 3 through 7. (See the Terrestrial Species section of this chapter for more details.)

Plants

Ecosystem vegetation components have played a large role in the relationship that native peoples have maintained with natural biophysical systems, landscapes, and cultural places. Native cultures have organized these components according to individual folk biology systems, which have some similarities to scientific categories. Woodlands; cottonwood, aspen and cedar groves; wetland, riparian and scabland vegetation communities; root fields; and berry patches are included in a mix of plant communities culturally significant to tribes. Vascular plants and their habitats continue to be of special significance to people and are valued in their own right. Most of these categories, however, were not addressed by the broad scale level of analysis produced for this

project. Some relative trends between alternatives could be assessed for some tribal interest species if their habitats were tied to terrestrial communities groups and potential vegetation groups.

The SIT identified at least 86 plants as species of tribal interest (Terrestrial STAR 1996). Plants of interest were analyzed by comparing historical vegetation cover types to projected vegetation conditions, by alternative (Quigley, Lee, and Arbelbide 1997). Species were analyzed for all tribes (project area-wide). Only one of the species from this list of plants was examined for viability concerns.

The one plant of tribal interest rated by the terrestrial panel is from the *Lomatium* genus and thought to be of some Warm Springs tribal interest. This plant was rated as unaffected by all alternatives, and its historical condition is seen as unchanged. The plant_s consistent viability panel weighted mean rating of 4.5 through all alternatives is likely due to the difficulty of a broad-scale viability analysis of a habitat type best suited to fine-scale analysis.

Thus, a fine-scale assessment of effects on such plant habitats and tribal interests would need to occur, examining both biological and cultural factors affecting ethno-habitat conditions and trends. This is expected to occur through multi-scale management processes, agency-tribe dialogues, ecosystem analysis, and fine-scale agency directions. A similar approach would be necessary for the recovery issue of broadleaf cover types (aspen and associates) located in dry, moist, and cold forests PVGs. These are critical for big game and livestock ranges and are of cultural interest to American Indians/tribes.

Effects of Exotics Plants on Native Plants

The general trend toward invasion of native vegetation communities by exotic plant species is a threat to the distributions of culturally significant species and ethno-habitats significant to American Indian peoples. This is assumed on the basis that most noxious weeds assessed by the SIT for range clusters are anticipated by the EIS team to affect plant communities of tribal interest. Effects from either Federal agency or American Indian reservation lands on each other through spread of exotic weeds is a shared concern, especially where it may degrade culturally significant habitats and a tribe's respective interests (for example, in rangelands, root and berry fields, wildlife and livestock grazing, American Indians/tribal gathering rights and practices, and native species distributions).

In general, the worst trends are expected in Alternatives 1, 2, and 5, and reserve areas of Alternative 7. No noxious weed control efforts are proposed in reserves of Alternative 7, and fire disturbances are predicted to increase the spread of weeds. Alternatives 3 and 4 are predicted to be the most effective in preventing the spread of noxious weeds and cheatgrass into dry grasslands, dry shrublands, and cool shrublands. Although not every range cluster would benefit to the same degree through these alternatives_ noxious weed control efforts, range clusters 5 and 6 would especially benefit. These are the two largest range clusters (have the most acreage of rangelands) where project area-wide tribal dependence on off-reservation livestock grazing is greatest. (For more noxious weed trend information, see this chapter's rangeland section and tables 4-38 through 4-40.)

Although Alternatives 4 and 6 share an equally great emphasis on noxious weed control through Integrated Weed Management, more acres are scheduled for these control efforts in Alternative 4. Alternative 4 would provide greater risks to tribal interests. These tribal interests relate to adverse consequences of herbicide use in noxious weed control efforts on culturally significant plants and human health.

Alternatives 3, 4, and 7 would regain dry grassland and prevent noxious weed spread in range clusters 5 and 6. This would likewise occur in range cluster 6 under Alternative 6. Dry shrublands would decline in Alternatives 1 and 2, except in range clusters 2 and 3, where existing noxious weed problems in dry shrublands are relatively minor. Dry shrublands would increase in range clusters 2, 3, and 5 under Alternative 4, with other alternatives generally being inadequate to prevent the spread of noxious weeds in these range clusters. Cool shrublands would increase and noxious weed spread prevention would occur in range cluster 5 in Alternatives 3, 4, and 7, and in cluster 6 in Alternative 4. However, cool shrublands are expected to decrease in range clusters 2 and 3.

Federal trust responsibility issues exist for all alternatives relative to how each would address exotic species invasions and corresponding effects on treaty reserved rights, exotic weed spread to Indian lands and relevant tribal interests, traditional use practices, and general concerns for ecosystem resiliency/health (such as livestock grazing and gathering of culturally significant plants). In general, it is predicted that divergent trends away from native vegetation types and the magnitude of exotic plant invasions would most adversely affect rangeland productivity and biodiversity in Alternatives 1, 2, and 5, especially in range clusters 1, 5, and 6, where the majority of rangelands exist in the project area. The adverse effect on rangeland productivity and biodiversity would be expected to affect livestock operations, wildlife, soil, native vegetation health, and ethno-habitats.

While cool shrub vegetation types may be relatively more resistant to exotic plant invasions, there are noxious weed species, for example leafy spurge, that are invasive into cool shrublands and extremely difficult to control. Species such as spotted knapweed and leafy spurge that characteristically dominate communities where they have spread are a threat to native vascular plant communities as well as ethno-habitats.

Cheatgrass monocultures are expected to be the focus of weed control efforts that are directed at cheatgrass. This exotic plant species is known to effectively compete with a number of culturally significant plant species. Where cheatgrass is a component, but in mixture with desirable perennials, burning would be the only method currently available for control. Herbicides in this situation might be used if native plant species have already been out-competed. Where cheatgrass is controlled and suppressed in range clusters, it is expected that certain plant ethno-habitats, root fields of lomatiums, for example, would benefit, if there are residual plants of desired culturally significant species that could provide a seed source.

It is anticipated that some tribes would have some concerns where reserves are allocated under Alternative 7 and located within their ceded lands, traditional homelands, or areas of interest. For example, the Ft. McDermitt and Duck Valley Reservations have off-reservation interests in traditional plant gathering, and livestock grazing, which may lie within reserves. The Ft. McDermitt Tribe, especially, would have a significant portion of its interest area lands allocated to reserves, 19 percent (3.08 million acres), and their reservation would be surrounded along its boundary within the State of Oregon by a large reserve.

Given the susceptibility of reserves to the spread of exotic plant species and the relative effects on ethno-habitats with Indian gathering and rangeland interests, there could be important short- and long-term effects on certain tribal cultural practices and reservation economies dependent on livestock grazing. The concern may also extend to reservation lands, especially where reserves are proposed along or near reservation lands (such as Fort Bidwell, Fort McDermitt, Duck Valley, and potentially the Fort Hall reservation and one Pit River rancheria.) This might also frustrate tribal efforts to maintain cultural integrity and socio-economic self-sufficiency in the long term. The Warm Springs and Umatilla Reservations may be in situations where noxious weed spread from and to adjacent Forest Service-administered lands require mutual (agency-tribe) efforts to address short- and long-term controls.

Negative effects on traditional gathering practices are expected to include impacts, to varying degrees, on tribal social cohesion, cultural survival, American Indian religious values/practices, and issues of individual well being. The degree and nature of these impacts would vary by affected area and tribal circumstance. Nonetheless, most tribes would be expected to contribute to and be supportive of cross ownership/interagency strategies to control exotic species invasions and decision-making/treatment plans, especially if they would avoid adverse impacts to culturally significant plants found on some noxious weed lists, and avoid incidental health concerns from any programs using herbicide treatments.

Landscape Ecology

In general, the discussion of effects on tribes are relative to the following: a) trends toward dynamic and resilient/healthy project area-wide ecosystems; b) effects to reliable and predictable habitats (forest seral stages) for culturally significant wildlife, c) aquatic species

and plants; and d) trends toward the historical range of fire disturbances and general DRFC conditions. (See this chapter's terrestrial ecosystems and landscape health sections, for more detailed information.)

In order to suggest how alternatives might affect the interest of Indian peoples, effects are described in terms fishing, hunting, gathering, and livestock grazing opportunities across a broad range of landscape types. In general, both big game hunting and fishing interests would benefit by mid/late seral forests and gathering by a mix of early/mid/late seral stages depending on the plant species. Also, a trend toward an historical range of fire disturbance would likely benefit all four cultural uses and allow for sustainable, dynamic and resilient ecosystem conditions.

Although there are some improvements made in Alternatives 3, 4, and 6 towards HRV disturbance levels of about 30 percent project area-wide per decade, no alternatives would make significant strides toward HRV for all terrestrial communities within 100 years. Furthermore it would require maintaining a 30 + percent disturbance level per decade to shift the trend towards the DRFC in order to re-establish a more dynamic and resilient ecosystem.

The alternatives, except Alternative 2, show disturbance of the same percentage of area per decade that approach historical levels (25 to 35 percent project area-wide per decade); however, management disturbances do not focus on getting landscape patterns back to natural patterns that would reflect/mimic more natural disturbance regimes. For example, the long-term landscape structures created by alternatives would remain at high risk from uncharacteristic disturbances in landscape positions and patterns. However, Alternatives 4 and 6 generally would resemble or closely reflect natural forest disturbance processes through prescribed fires and/or thinning, and pose less risk of large, high severity wildfires; Alternatives 1, 2, and 7 generally would not.

There may be short-term risks to landscape ecosystem health in Alternatives 4 and 6, where restoration emphasis activities could increase disturbances in a effort to provide long-term ecosystem benefits. An example is aquatic/riparian restoration activities, where removing problem roads may increase sedimentation of streams in the short term. Alternative 6 is expected to have a relatively lower risk of short-term adverse effects since it would emphasize adaptive management approaches, going slower with restoration efforts to ensure greater restoration benefits to landscape systems. Alternative 7, with its passive management approach, may not as effectively treat problem roads in aquatic zones, thereby increasing the probability of long-term adverse effects to landscape ecosystem components. (See the effects to watershed processes in this chapter).

Cultural Uses

Off-reservation interests of American Indians and tribal government extend to a wide range of environments, resources, species and culturally familiar places, which are influenced or dependant on habitats, habitat connectively, terrestrial community types and resilient ecosystems.
Tribal fishing interests would likely benefit by a trend toward DRFC and an historical range of landscape conditions for fire disturbance and aquatic integrity conditions. Refer to the Human Uses and Values section for a relative rating of recreational benefits regarding quality fishing. (See this chapter's Aquatics and Physical sections for a further detailed discussion of effects on aquatic and hydrologic systems.)

Restoration of landscape integrity and terrestrial communities near or within DRFCs consistent with biophysical environments should contribute to overall aquatic health through interactions with upland conditions and processes. Landscape structures that are consistent with natural disturbance regimes are likely to support watershed scale disturbances and smaller scale process (such as coarse woody debris recruitment to streams, and riparian vegetation for stream shading) important for aquatic health. Alternatives 4 and 6 provide for restoration and maintenance of ecological processes that would be more consistent with biophysical environments; Alternatives 1 and 2 would not. Alternatives 3 and 5 would be between Alternatives 4 and 6, and 1 and 2.

Tribal big game hunting interest within forest clusters 4 and 5 could be caught up in a conflict between wildlife big game security

objectives and ecosystem health objectives to restore natural disturbance regimes. This issue involves human needs for sustainable, dynamic and resilient conditions consistent with biophysical environments where it lies above the HRV standard for mid-seral and late-seral multi-story conditions. (See Forest Systems figures 4-3 through 4-11, which discuss the percent of subbasins in HRV.)

Tribal gathering interests are related to site-specific ethno-habitats that are often dependent on naturally discrete (fragmented) habitat types. Those that are associated with upper montane meadows, wetlands, and scabflat landform types were not addressed for effects by alternatives because of the scale of the evaluation. However, rangeland standard and their rationales speak to some of the habitat related to gathering interests. Overall the habitat trends and management direction would occur at finer assessment scales through the consultation and ecosystems analysis processes (see all three Tribal objectives and standards in Chapter 3 and guidelines in Appendix H). Alternative effects on gathering practices are relative to effective consultation practices and landscape processes (see table 4-60 for Agency-Tribal Relations on Consultation, and table 4-12).

Tribal grazing interests extend project area-wide; however, southern project area tribes such as the Burns Paiute, Fort McDermitt Paiute, and Duck Valley Tribes may have a relatively greater socio-economic interest. Landscape ecology and rangeland information indicate Alternatives 1 and 2 would provide low dynamic landscape resiliency, Alternatives 3, 6, and 7 would provide moderate and Alternatives 4 and 6 high landscape resiliency. Effects on these tribes are anticipated to vary relative to an Alternative 7 allocation of their areas of interest into reverses. See the Human Uses and Values section of this chapter for a relative rating of landscape predictability and a relative rating of economic interest in grazing for livestock production by alternatives.

Composite Ecological Integrity Trends

A composite ecological integrity estimate for landscape ecology was developed for the project area's 164 subbasins in order to examine how each would respond over the next 100 years under the seven different alternatives. Three primary indicators of subbasin composite ecological integrity trends were used: 1) Forest and rangeland vegetation; 2) Riparian management; and 3) Road density changes. These indicators address a number of specific ecological integrity components (Aquatic/riparian, terrestrial, landscape, hydrology), their interactions, and the condition and trends for these components.

The current composite integrity of subbasins (4th field Hydrologic Units Code level) were rated as having high, moderate and low trends, and assigned a value of -1 (downward trend), 0 (stable trend), or +1 (upward trend) depending on their conditions for forest, rangelands, and aquatic systems. The sum of the three indicator variables then resulted in integer values that varied from -3 to +3 for each subbasin. A rating of +3 would indicate that all three primary indicators would contribute to positive trends in the overall ecological integrity of a given subbasin from its current ecological integrity rating. A +3 positive trend within a subbasin that is currently in low ecological integrity may remain in low condition, but would improve through all three primary indicator avenues.

These ecological integrity ratings take into consideration the combination of current conditions, future management actions through project alternatives, and unplanned/natural disturbance events (such as fire, flood, insects and disease). (See Composite Ecological Integrity section, later in this chapter.)

Given the emphasis and concerns tribal governments place on the ecological conditions in their interest areas lands, a chart is provided below (table 4-62) to illustrate the ecological integrity trends for 17 projected affected tribes using the composite ecological integrity information. The preliminary tribal interest area maps developed by the science team were used to provide composite ecological integrity ratings for each tribe's area, projected over the next 100 years in each alternative. A tribe's area of interest typically includes their reservation, any treaty ceded lands, tribal homelands, and adjacent lands where a tribe has maintained traditional, social, political and economic interests. A tribe's area of interest usually has no discrete boundaries and often overlap those of neighboring tribes. (See Appendix C.)

Table 4-62. Ecological Integrity Trends Relative to 17 Tribes' Interest Areas, Project Area.

			Alternatives						
Reservation Names	**Current**	**Subbasins**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Burns Pauite	Low-Mod.	30	-2	0	0	1	-1	1	1
Coeur d'Alene	Low	8	-3	0	0	1	0	1	0
Colville	Low-High	17	-3	0	1	1	0	1	1
Duck Valley	Low-High	36	-2	0	1	0	-2	1	1
Flathead	Low-High	21	-3	-1	1	1	-2	1	1
Fort Bidwell	Low-Mod.	13	-2	0	1	1	-2	1	1
Fort Hall	Low-High	53	-2	0	1	1	-1	1	1
Fort McDermitt	Low-Mod.	16	-2	0	1	2	-2	1	1
Kalispel	Low	10	-3	-1	0	0	-2	0	0
Klamath	Low-Mod.	15	-3	0	0	1	-2	1	1
Kootenai of Idaho	Low/High	11	-3	-1	-1	1	-3	0	1
Nez Perce	Low-High	42	-3	0	1	1	-1	1	1
NW Band Shoshoni	Low-High	10	-3	0	1	1	-2	1	1
Spokane	Low	9	-2	0	1	1	0	1	0
Umatilla	Low-High	33	-3	0	1	1	-2	1	1
Warm Springs	Low-Mod.	20	-3	0	0	0	-2	1	1
Yakama	Low-High	13	-2	0	1	1	0	2	1

This table was constructed taking the individual sub-basin ratings within a tribe's area of interest and displaying them for each alternative. The ecological integrity ratings were then summed for each cell and divided by the number of sub-basins within a tribe's area of interest. These numbers were then rounded to the nearest integer to provide an overall value. These ecological integrity trend values range from -3 to +2. (The number of subbasins for each tribe's area of interest is indicated under the sub-basin column. A subbasin is equal to a 4th-field hydrologic unit code [HUC].)

The implications of table 4-62 are that all tribes would have declining trends for their areas of interest, contributed by two or three of the primary indicators of ecological integrity, under Alternative 1. Similarly, tribal interest areas would either remain stable or experience decline in ecological integrity under Alternative 5. Alternative 2 would largely provide stable integrity values for most tribal areas. Alternatives 3, 4, 6, and 7 would show some improvements from current conditions for most tribes or remain stable for the most part. Those tribes whose locations are peripheral to the project boundary could draw some inferences from the current and projected trends of neighboring subbasins with ecological integrity ratings for their areas of interest.

Again, this chart does not provide an absolute overall rating of ecological trends from low, moderate, to high. Rather its shows trends from current conditions in terms of either declining, being stable, or improving as an indication of the portion of change contributed by BLM and Forest Service actions.

Social Well-Being

The need for Federal agencies to consider and promote the social well-being of affected American Indian tribes, communities, and their members has a foundation in both the expressed interests of individual tribes, Federal government trustee role, and those legislative

acts Congress adopted to express the Federal Government_s responsibilities to American Indians. Agency effects on air quality, water quality and quantity, tribal cultural integrity, and socio-economic conditions, and tribal assets and resource integrity on reservations together form Federal Government responsibilities (relevant to BLM and Forest Service agencies) to consider the social well-being of tribes.

Many of the trust responsibilities toward tribes are similar to responsibilities to States and counties, where self-determination and self-sufficiency is encouraged and negative effects on economic resiliency and general social well-being are avoided unless for the greater good of society. However, there are some important distinctions, which include the unique nature of tribes_ cultural, social, governmental, and economic circumstances and needs. One small example is in the nature of how portions of receipts collected from timber sales are re-distributed back to area counties; tribes do not receive such financial benefits and may rely on other indirect benefits, avenues, and economic opportunities.

Little specific information was acquired by the SIT for the socio-economic conditions of project area communities and the effects on the cultural value economic relationships that tribes have with public lands and resources from agencies_ management practices. However, Bureau of Indian Affairs reporting of project area reservation employment figures in 1993 characterize most as having high unemployment relative to other project area communities.

The preceding discussions on effects of alternatives on tribal cultural uses and water-land concerns directly bear on the social well-being of tribes. This includes off-reservation use of public lands to carry out religious, subsistence, social, economic, and other cultural traditional practices, which relates to cultural survival issues, reservation employment rates, social cohesion, and socio-psychological well-being of tribal membership. The information presented in the other three sub-sections is considered here in providing a relative rating among alternatives for their potential effects on tribal social well-being.

Generally, Alternatives 1 and 2 would be relatively low in their ability to provide benefits to tribal social well-being. Factors include lack of consistent policies for meaningful consultation process in regional and land-use plans or return to desired DRFC trends; protection of culturally significant fish and wildlife species and their habitats with viability concerns; recognition or management of places; providing for access rights; and addressing interests or rights to healthy, sustainable, or useable ethno-habitats. Alternative 5 also would provide a relatively low response, but is expected to perform better in the area of meaningful consultation and many other above-noted areas of tribal interests/rights.

Compared to Alternatives 1, 2, and 5, Alternatives 3 and 7 would respond better, especially with regard to access to decision-making, aquatic protection and restoration, and in providing trends in viability concerns and landscape ecology closer toward desired conditions. Overall the alternatives considered most beneficial to social well-being are Alternatives 4 and 6 given aquatic health, riparian protection, more positive trends toward habitat and inferred species population potentials, and access to effective consultation. Alternatives 3 through 7 address both access for traditional uses, even in Alternative 7 reserves, and consideration of places through direction for an ongoing consultation process.

The overall rating of alternatives for allowing grazing are of interest to the economic diversification and resiliency of tribes with interests in range clusters 4 and 5. It would appear that Alternatives 1, 2, and 7 would provide a relatively low benefit; Alternatives 3, 5, and 7 a moderate benefit; and Alternatives 4 and 6 the greatest benefit. Relative ratings are based on how alternatives would remain within rangeland ecological capabilities, providing a buffer between ecological capabilities and economic gains as directed by rangeland-use laws such as the Taylor Grazing Act and Federal Land Policy and Management Act.

Composite Ecological Integrity

Examining BLM- and Forest Service-administered lands nearest to tribal lands for composite ecological trends from current conditions may help in understanding some of these agencies' effects on social well-being of tribes and their communities (table 4-63). Tables 4-63 and 4-64 examine what the

composite ecological integrity trends would be with regard to social well-being for subbasins immediate to where 16 tribes are located, and/ or where a tribe owns lands or has lands held in trust by the Department of Interior. (The Northwest Band of Shoshoni reside in northern Utah outside of the Project area. However, a subbasin rating is provided for their office in the Blackfeet, Idaho, area.)

The table's ecological integrity ratings were taken from subbasin(s) that include or overlap a tribe's field office, headquarters, and/or a reservation using the same methodology described earlier for table 4-62. For each alternative where a tribe is located within or adjacent to more than one subbasin, each associated value was summed, divided by the total of subbasins, and then rounded to the nearest integer. The column titled "current" describes ecological conditions from historical to current circumstances as depicted in the composite ecological integrity map. (See this chapter_s section on Composite Ecological Integrity.)

Table 4-64 shows the summation of the ratings displayed in Table 4-63 and their ranges under each alternative considering just those sub-basins where project area tribes reside or have a field office. The relative ranking of alternatives was accomplished by adding the individual ratings for each alternative column and dividing it by the total (32 sub-basins). The HUC that is shared between the Colville and Spokane and the Fort Hall Shoshone-Bannock and NW Band of Shoshoni were counted only once between the tribes in totaling the rating numbers in order to avoid double weighting of those HUC ratings.

The implications suggested by the table's ranking of alternatives is limited to the collective local areas of these 16 tribes. The overall ratings of alternatives suggest Alternatives 3, 4, 6, and 7 would show stable trends, while Alternatives 1, 2, and 5 would show mostly stable or downward trends in their composite ecological integrity. The significance of alternative ratings for agency effects on American Indian communities are most applicable where Forest Service- and BLM-administered lands have direct effects on American Indian communities and where representative sub-basins consider the whole of a community interface area. Thus the composite ecological integrity trends for tribes such as the Kootenai of Idaho and Confederated Tribes of the Umatilla Indian Tribes may not be as significant as for the Duck Valley Indian Community in considering effects on Indian communities.

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Tribes may draw inferences from all of the sections' ecological integrity tables concerning aquatic and forest/range vegetation structures by tribes. However, the Federal Government's responsibilities to tribes, and its corresponding need to be equally sensitive to all project area residents, creates a complex set of opportunities for BLM and Forest Service decision-making. General and specific benefits to subbasin ecosystems and resources would help provide for the interest of tribes, especially as a group of peoples dependant on natural diversity, and natural concentrations of resources.

Table 4-63. Ecological Integrity Trends Relative to 16 Tribes' Local Areas, Project Area.

Reservation Names	Current	Sub-basins	Alternatives 1	2	3	4	5	6	7
Burns Pauite	Low	1	-3	0	0	0	-2	1	1
Coeur d'Alene	Low	3	-3	-1	-1	0	-2	0	0
Colville	Low	4	-3	0	1	1	-1	1	0
Duck Valley	Moderate	4	-2	0	2	2	-2	0	1
Flathead	Low-mod.	3	-3	-1	0	1	-1	1	0
Fort Hall	Low	3	-2	0	0	1	-2	1	0
Fort McDermitt	Moderate	1	-2	0	2	2	-2	0	1
Kalispel	Low	1	-3	-1	0	0	-3	0	0
Klamath	Low	1	-3	0	0	0	-2	1	1
Kootenai of Idaho	Low	1	-3	-1	0	-3	0	0	1
Nez Perce	Mod.-low	4	-3	-1	1	1	0	2	2
NW Band Shoshoni	Low	1	-2	0	0	1	-2	1	0
Spokane	Low	2	1	0	1	1	0	1	0
Umatilla	Low	1	-3	0	0	0	-2	1	0
Warm Springs	Mod.-low	2	-3	-1	1	1	-2	1	1
Yakama	Mod.-low	3	-3	-1	1	1	1	2	1

This table was constructed taking the ecological integrity ratings from sub-basin(s) that include or overlap with a tribe's field office, headquarters, and/or a reservation using the same methodology described for Table 4-62. For each alternative where a tribe is located within or adjacent to more than one subbasin, each associated value was summed, divided by the total number of subbasins (32), and then rounded to the nearest integer. (The column titled "current" describes ecological conditions from historical to current circumstances as depicted in the composite ecological integrity map.)

Table 4-64. Ecological Integrity Trends Summation for 16 Basin Tribes' Local Areas, Project Area.

	Current	Alternatives 1	2	3	4	5	6	7
E.I.T. Ratings (Means)	Low	-2.66	-0.4	0.56	0.8	-1.3	0.97	0.72
Ranges	L to M	-2 to -3	0 to 1	2 to -1	2 to 0	1 to -3	3 to 0	3 to 0

This table shows the relative ranking of the alternatives for all project area tribes by adding the individual ratings for each alternative column and dividing by the total 32 Hydrologic Unit Codes.

Effects of the Alternatives on Ecological Integrity and Social/Economic Resiliency

Unless otherwise noted, information in this section is based on the *Evaluation of Alternatives* (Quigley, Lee, and Arbelbide 1997) and a more detailed paper describing the integrity work (Sedell et al. on file at the Walla Walla Office of the ICBEMP).

Chapter 1 describes two primary needs underlying the proposed action: (1) restoration and maintenance of long-term ecological health and integrity; and (2) supporting the economic and/or social needs of people, cultures, and communities, and providing sustainable and predictable levels of products and services. These were examined as part of the *Evaluation of Alternatives*. These needs, combined with the goals for alternatives described in Chapter 3, imply the desire to achicve and maintain a higher level of ecological integrity, and social/economic resiliency. The evaluation of ecological integrity and social/economic resiliency, the risk to ecological integrity from interactions with people, and the risks to people and their assets from wildlands are part of a more comprehensive evaluation within this chapter. The information in this section needs to be considered with other in-formation in this chapter for a more complete understanding of how alternatives respond to the Purpose and Need statement in Chapter 1.

An estimate of current composite ecological integrity across the planning area was made for lands administered by the Forest Service or BLM (see Chapter 2). The evaluation in this chapter also includes an estimate of current social/economic resiliency, and risks to ecological integrity and human assets. In addition, trends in ecological integrity, trends in social/economic resiliency, and trends in risk to integrity and human assets were estimated for each alternative for the next 100 years on lands administered by the Forest Service or BLM.

Ecological Integrity

Current

The Science Integration Team (SIT) recognized that there are no direct measures of ecological integrity and that assessing integrity requires comparisons against a set of ecological conditions and against a set of clearly stated management goals and objectives as described in the alternatives. The SIT also recognized that this process is not a strictly scientific endeavor (Wickium and Davis 1995), because to provide meaning, ecological integrity must be grounded in desired outcomes. The initial estimates were based on current understanding and information, and are not presumed to be absolute.

As discussed in Chapter 2, current ecological integrity was based on the analysis of the 164 subbasins within the project area. Relative integrity ratings (high, moderate, low) were assigned by subbasin for forestlands, rangelands, forestland and rangeland hydrology, and aquatic systems. The analysis was based on information from the *Scientific Assessment* (Quigley and Arbelbide 1996 and Quigley, Graham, and Haynes 1996) and understandings of conditions and trends. At present, 26 percent of the BLM- or Forest Service-administered lands is in high, 28 percent is in moderate, and 46 percent is in low ecological integrity. Map 2-34 displays this information.

Future Trends

Methodology

Projecting ecological integrity into the future for each alternative was done based on current integrity, future management actions as defined by alternative, and unplanned disturbance events. projections of future ecological integrity were made as a composite; no attempt was made to project the individual integrity

components. Many elements contribute to composite integrity trends. These elements were represented by three primary indicators or "proxies":

Forestland and rangeland vegetation (as integrated indicators of such elements as disturbance, succession, management activities, exotic weeds, and habitat);

Riparian management (as indicators of such elements as aquatic environment, riparian communities, connectivity of riparian and aquatic ecosystems across Forest Service- BLM-administered land, fragmentation, and habitats); and

Road density changes (as indicators of such elements as change in erosion, sediment, aquatic conditions, and exotic weed introductions).

The current composite integrity of subbasins was rated by alternative as having high, moderate, and low trends compared to historical integrity, and assigned a value of -1 (downward trend), 0 (stable trend), or +1 (upward trend) depending on the subbasin conditions for forestland, rangeland, and aquatic ecosystems. The sum of the three indicator variables then resulted in values that varied from -3 to +3 for each subbasin. A rating of +3 would indicate that all three primary indicators would contribute to positive trends in the overall ecological integrity of a given subbasin from its current ecological integrity rating. The trend estimates are not indicators of overall ecological integrity in terms of low, moderate, or high; an upward trend within a subbasin in low current ecological integrity may remain in low condition but be improving.

Results

Summing across all the Forest Service- and BLM-administered lands within the planning area shows that the alternatives would provide very different outcomes in overall ecological integrity trends (figure 4-54).

Alternatives 3, 4, 6, and 7 would show mostly upward trends over time. These alternatives have consistent aquatic/riparian conservation strategies coupled with either passive or active restoration/conservation management emphasis. Restoration actions would focus on restoring biophysical processes, functions, structures, and patterns across the landscape. Alternatives 4 and 6 would show the highest upward trends. Alternative 7 would have many upward trends but is also projected to show some downward trends in the reserves and in some unroaded areas. Over time, natural disturbance events such as fire, insects, and disease would tend to be of higher intensity and more unpredictable, especially within reserves.

Alternatives 1, 2, and 5 are less focused on restoration of ecological processes, functions, structures, and patterns and would have less consistency in managing aquatic/riparian resources. They would also have less emphasis on reducing impacts from roads. Alternatives 1 and 5 would have more management emphasis on production, which can increase risks to aquatic, riparian, and terrestrial resources. Under these alternatives, many subbasins would become ecologically stable over time, but many would also show downward trends.

Social/Economic Resiliency

Current

County social/economic resiliency of the 100 counties within the project area was rated using a system of high, moderate, or low. This composite rating system combines three factors: population density, economic diversity, and lifestyle diversity. Methodology is discussed in the *Scientific Assessment* (Quigley and Arbelbide 1996 and Quigley, Graham, and Haynes 1996). Using this system, there were 17 counties that rated as having high social/economic resiliency, 30 as moderate, and 53 as low. The high to low ratings are not meant to be value ratings; rather the intent was to describe the county's adaptability to changing conditions. Generally, most of the people in the project area (82 percent) live in counties that are moderately or highly adaptable, as measured by the social/economic resiliency. Most of the land area (68 percent), however, is in the low category. Approximately 53 percent of the population in the project area lives in the high social/economic resiliency counties (15 percent of the project area). Conversely, the **45**

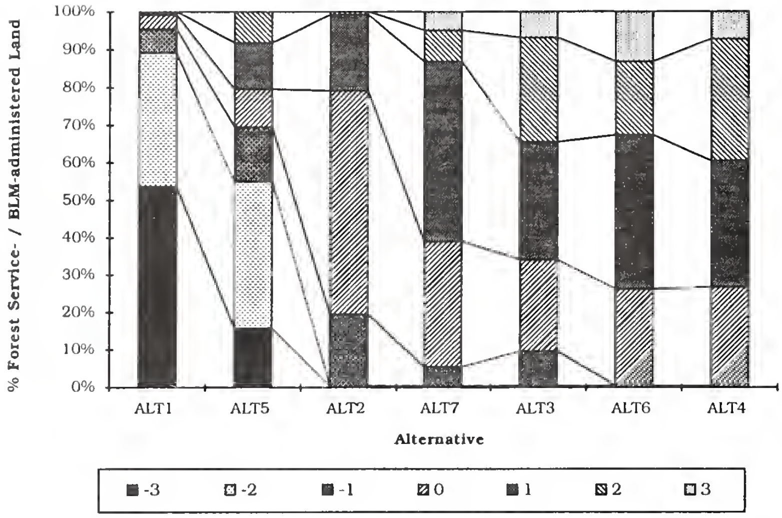

Figure 4-54. Composite Ecological Integrity Trends, Project Area.

most sparsely settled counties have 14 percent of the planning area's human population. High social/economic resiliency is associated with more densely populated areas ~ a condition not usually found in areas with a high percentage of lands administered by the Forest Service or BLM.

Future Trends

Methodology

The effects of Forest Service and BLM resources and management activities on future trends in economic/social resiliency were estimated for each county. Future trends are dependent on current resiliency, future management actions by the Forest Service and BLM, unplanned natural disturbance events (such as floods, fire, and volcanic eruptions), and economic/social changes not necessarily related to Forest Service or BLM policies or management. Recognizing the number of external influences beyond the control of the agencies, this analysis focused on how alternative management strategies might affect resiliency assuming other factors did not change.

As with ecological integrity, there are no direct measures of social and economic resiliency in the literature. This is not strictly a science question. To provide meaning, social/economic resiliency must be grounded to desired outcomes. Population density was assumed to be a good proxy for social/economic resiliency to make some broad assessments about future trends because economic resiliency, lifestyle diversity, and population density generally vary with each other. Projecting population density was the most robust and predictable estimate available.

Results

As of 1995, the population of the project area was 3.1 million. Census Bureau projections estimate the counties in the project area will have 6.0 million people by 2045 *(Economics* STAR 1996). This growth rate is higher than the population growth rate for the United States as a whole. Some medium population density counties shift to high density, while some sparsely populated counties become medium density counties. Because of the projected increase in project area population, there will

be more and more people in the high density counties. This is particularly true in "recreation" counties, which are projected to attract a disproportionate number of in-migrants (McCool and Haynes 1996). In terms of social/economic resiliency, this means a continued shift toward higher social/economic resiliency, with one exception — counties which remain in the lowest population density are classed as frontier counties.

None of the 100 counties are projected to lose population between 1995 and 2045, although a few will have only minor increases. As other areas become more densely populated, these few will be increasingly isolated and have difficulty attracting infrastructure and investments. On the other hand, they will be more apparent as "refuges" for people seeking solitude.

Population increases were not projected to vary by alternative. Thus, changes in social/economic resiliency by alternative were not estimated.

Managing Multiple Risks

Through the *Evaluation of Alternatives*, risks were identified to ecological systems, as well as to society. This can be discussed and displayed in many ways. Two types of risks were evaluated by the SIT: risks to people and their assets from wildlands (such as floods, wildfire, and animal interactions with people), and risks to ecological integrity from people.

Current

Although risks are always present no matter which activities are proposed or where they are located within the planning area, more risks occur where forestlands are adjacent to non-forestlands. It is typically where natural disturbance processes, such as fire regimes, have been most altered. These lands are also near many communities, which depend on adjacent lands for recreation, livelihoods, and overall quality of life. Fire hazards are typically high. Many of these lands are important wintering areas or contain habitat diversity or components not found elsewhere. Smoke from wildfire or prescribed fire is often a concern. These areas also tend to have higher road densities affecting habitat, hydrologic processes, and the advancement of exotic weeds.

In areas where populations are expanding the most and wildland ecological integrity is highest, the risks tend to be greatest. Risks are further exacerbated by more limited options for such things as vegetative treatments and prescribed fire. Risks tend to be higher in forested settings than in rangeland settings. Managing these risks will continue to be high priority for the Forest Service and BLM, which will continue the trend of shifting valuable resources and investments from the more general wildland settings to these areas of interface. Considering the risks associated with human and ecological interactions on lands administered by the Forest Service or BLM, nearly 50% of the area is rated with a moderate risk and approximately 18% has a high or very high risk (see figure 4-55).

Future Trends

Alternatives 3 through 7 have more emphasis on recognizing these risks than Alternatives 1 and 2 (figure 4-56). Alternatives 4 and 6 would more actively respond to these multiple risks, especially in placing emphasis on hazard reductions from fire in concert with aesthetics and habitat needs. Alternative 7 would pose greater risks from wildfire, insect, and disease outbreaks in some areas, as natural disturbances may not always be contained within reserves. Alternative 5 places emphasis on these risks, but it would be a more variable response due to different levels of management priority throughout the planning area.

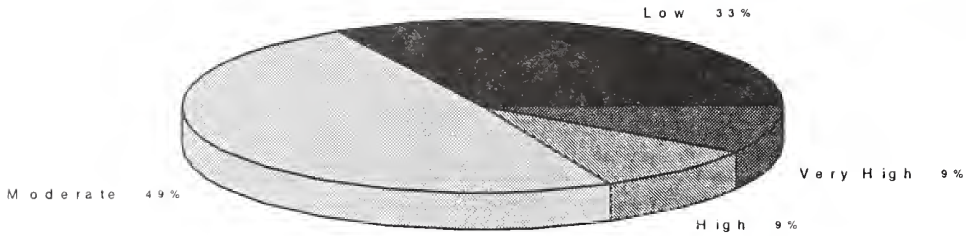

Figure 4-55. Risks Associated with Human and Ecological Interactions, Project Area.

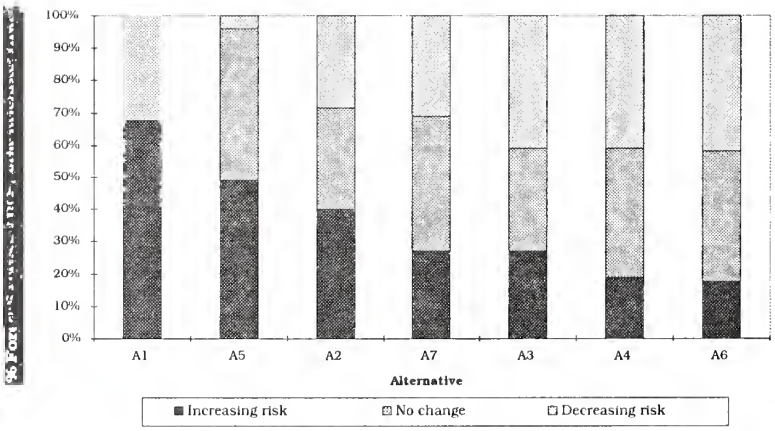

Figure 4-56. Alternatives and Risks, Project Area.

Cost Analysis

Alternatives were compared for their effects on agency budgets. Two steps were developed for understanding the effects: estimates of costs of each alternative, and a sensitivity analysis of each alternatives costs.

The cost estimates shown in table 4-65 later in this chapter do not comprise the total Federal cost to implement an alternative. Costs were estimated only for Forest Service and BLM management activities described in Chapter 3, such as riparian restoration and integrated weed management. These costs vary by alternative and provide one of many ways to compare alternatives. Other costs, such as administrative and research costs, were not calculated at the time this chapter was completed. Costs to other Federal agencies (for example costs to the National Marine Fisheries Service, U.S. Fish and Wildlife Service, and Environmental Protection Agency for collaboration and consultation required under the Endangered Species Act, Clean Water Act, or Clean Air Act) were not calculated at the time this chapter was completed.

Assumptions

The cost analyses of the alternatives were initiated with an assumption that Alternative 2 should probably reflect current budget levels and agency costs. This assumption allowed for comparison of costs to current budget information for a "bascline" condition. This approach could help determine how the cost estimates developed for each alternative compare to current budget levels.

For the development of cost estimates, it was assumed that average costs for a certain activity would properly reflect the true costs for these activities in the basin. One set of average costs was developed to be applicable for both the Eastside EIS and the UCRB EIS.

It was also assumed that the decisions made in the EISs reflect only a portion of current agency budgets in the region. Many programs currently operated by the Forest Service and BLM will not be affected by decisions from the EISs.

Methodology

Estimates of the probable costs of implementation of the alternatives were developed by a special team made up of representatives from the EIS Team and budget office representatives for the Forest Service Pacific Northwest Region and Intermountain Region, and BLM State offices from Idaho and Oregon. Data sources for estimates included information on file in regional, State and administrative unit offices and national level publications of the agencies. At the time of the development of cost estimates, the team consulted with several field offices to gather information.

For almost all items the approach for cost estimates was to price each activity or requirement by estimating a cost per unit (such as the cost of pre-commercial thinning per acre), and calculating the total costs based on the level of activity proposed for each alternative. Costs were calculated for a ten-year period and then presented as annual costs, with annual costs being one tenth the ten-year costs (inflation factors were not included). The effort to develop implementation costs was to report the relative differences in potential effects on agency budgets, not necessarily to show an overall agency budget based on each alternative. There are many management activities by the Forest Service and BLM which are outside the decisions to be made in this EIS.

Cost estimates on a "per acre" basis were developed for the following activities: improved livestock management, rangeland improvements, integrated weed management, prescribed burning, riparian improvement, range monitoring and inventory, commercial timber harvest, pre-commercial thinning, prescribed burning in forests, watershed restoration, forest monitoring/inventory, required watershed analysis (Ecosystem Analysis at the Watershed Scale), additional watershed analysis, and public involvement. Road closure costs were developed on a per mile basis, and included assumptions for different types of road closures (restricting access only versus obliteration to meet watershed objectives).

The cost estimates developed were intended to err on the side of being higher than may be experienced by some or most of the operating units. For example, timber sale preparation and administration costs (exclusive of NEPA costs and road building) in Alternatives 3 through 7 are assumed to be 30 percent higher per 1,000 board feet than for Alternative 1.

The activity tables in Chapter 3 of the EISs provided activity levels for watershed restoration on a per acre basis, but cost estimates were not developed on this basis because of the need to first define the level of road closures and other activities (thinning, prescribed burning) which would also contribute to watershed restoration. In addition, the Rule Sets for the activity levels in Chapter 3 display several actions under watershed restoration, including: increased road maintenance, improved road condition (surface and/or drainage), reduced road related erosion, obliteration of already closed roads, increased coarse woody debris, riparian plantings, and in-channel restoration.

In an effort to estimate social/economic impacts, it is necessary to develop a package of watershed restoration activities, some assumptions regarding their impact on a watershed, and from that, project an overall cost of watershed restoration by alternative. Aggregating different proposed restoration activities and relating them to the number of acres of watershed restoration is difficult. For example, activities such as road maintenance or in channel improvement are usually expressed in terms of linear miles (either improved or decommissioned). To present cost estimates, several assumptions were needed: first the link between specific activities and amount of forestland acreage affected, secondly a suite of watershed restoration activities.

Until these relationships are further defined, an activity- or component-based cost estimate for watershed restoration would be difficult to develop. In the interim, cost estimates for watershed restoration presently consist of an assumption where Alternative 2 equates to the current costs of watershed restoration. Costs for the other alternatives were then varied based on the watershed restoration level of activity for each alternative. Alternative 4 had the highest funding and activity level and Alternative 7 had the lowest.

With only limited information (beyond some objectives and standards) for development of a monitoring program, costs for monitoring were estimated based on acreage of range and forest land (based on vegetation), and an estimated monitoring cost per acre. This cost per acre was varied by alternative to respond to the theme of the alternative.

Costs were not estimated for: "adaptive management," developing a road management strategy at the local level, development of snag and coarse woody debris direction at the local level, consultation costs with Indian tribes, fuels reduction in wildland-urban interface areas (assumed to be covered by harvest, thinning and prescribed fire activities), community economic development participation, a standard which urges use of native species for post-fire rehabilitation over less expensive and more available non-native sources, recreation site development and improvements, interpretive facilities, current road maintenance, setting priorities within each 4th-field HUC for vegetation management and restoration activities, and designing all stream crossings to handle a 100-year flood event. Of all these costs, the potentially most significant cost over time would occur with reconstructing stream crossings, but there was no information on the number of stream crossings needing to be addressed on over 65,000 miles of roads on BLM- and Forest Service-administered lands. Nevertheless, this cost item is partially addressed in road closure and watershed restoration activities.

This section does not include costs of wildfire suppression. Costs estimated from the Landscape Ecology section of the *Evaluation of Alternatives* (Quigley, Lee, and Arbelbide 1996, 1997) were reported in the section on Human Uses and Values in Chapter 4. The ten-year cost estimates for fire suppression underestimate potential suppression costs because the Columbia River Basin Successional Model (CRBSUM) does not model the growth or spread of wildfires. In addition, wildfire suppression costs are largely affected by emergency suppression funding at the national level, while this section provides cost estimates for the alternatives at the regional or local level. No cost estimates for post-wildfire rehabilitation were developed. These costs are usually provided by national emergency funds also.

A significant additional cost item beyond the activity tables in Chapter 3 was for Integrated Weed Management. Alternatives 3 through 7 provide overall policy level direction, and the "improve rangeland" activity levels reflect current understanding of the areal extent of the weed problem. Application costs and acreage combine to create a very significant annual and ten-year cost.

Based on total annual implementation costs of the alternatives, it appears that Alternatives 3, 4, and 5 would have the greatest relative increase in costs compared to Alternatives 1 and 2 as (the baseline or no-action alternatives).

Results

Activities and costs which may or may not be directly or indirectly affected by the EIS is included in the cost calculation tables. For example, the annual cost estimate for Alternative 2 is about $80 million, while the total estimated annual budgets for the Forest Service and BLM in the UCRB are around $250 million - exclusive of capital construction and land acquisition. Table 4-65 provides an annual estimate of costs for each alternative.

Sensitivity Analysis

Some requirements can be considered costs additional to current agency land management. The costs of an Integrated Weed Management Strategy for rangelands is one such cost. Some costs represent no additional cost, but instead a reprioritizing of existing resources to meet the broad-scale ecosystem objectives of the alternative. The cost for rangeland improvements is a good example of this kind of cost. Other additional costs, such as required Ecosystem Analysis, will partially substitute, and provide partial savings, for agency costs connected with preparation of NEPA documents.

The performance of the alternatives under different funding levels could be inferred by examination of those cost items which are more dependent on increases in appropriated funds. The EIS Team selected several cost items on which full implementation are highly sensitive, moderate to highly sensitive, moderately sensitive, or have low sensitivity to appropriated funds in order to achieve implementation (see table 4-66). The highly sensitive items included new programs with significant expenditures, or programs which have experienced chronic under funding: integrated weed management, forest and range monitoring, additional watershed analysis, road closures on rangelands, and public involvement. Moderate to highly sensitive items are those which need a significant increase in budget, but which may be funded by commercial timber sales as well as appropriated fund include: watershed restoration and road closures in forest lands. Items with moderate sensitivity are those where there is an increase in budget but the amount of increase may not be as significant include: prescribed burning (both forest and range), improved livestock management plans, and precommercial thinning. Items with low sensitivity are those where funding has traditionally been available or the overall cost is low, and include: commercial timber harvest, required watershed analysis, riparian improvement and rangeland improvements. Table 4-66 provides a comparison of the costs for each alternative for each category of sensitivity.

A comparison of the alternatives shows that Alternatives 1 and 5 would have the highest proportion of projected activities in line items which may be least sensitive to appropriations, (see table 4-66). At the other end of the spectrum, Alternatives 6 and 7 would be most sensitive to appropriations and Alternatives 2, 3 and 4 would fall in the middle.

Table 4-65. Costs of Alternatives[1] and Actual Obligations for Fiscal Year 1999, UCRB Planning Area.

Management Actions(s)	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
	(in thousands of dollars)						
Subbasin Review[2]	-	-	840	840	840	2,520	462
Ecosystem Analysis at the Watershed Scale	354	519	4,620	4,620	4,620	9,240	4,620
Road Condition Risk Inventory (Yrs 1-2)	-	-	350	350	350	350	350
Access and Travel Management Plan (Yrs 3-7)	-	-	2,520	2,520	2,520	2,520	2,520
Develop Interagency Monitoring Protocol	-	-	250	250	250	250	250
Monitoring & Inventory	9,753	10,761	11,338	11,906	11,338	11,906	11,338
Integrated Weed Management	500	500	5,120	6,760	1,920	1,920	2,560
Public Involvement	344	318	527	537	573	405	283
Tribal Consultation	-	-	2,820	2,820	2,820	2,820	2,820
Survey & Nominate Cultural Sites	-	-	2,300	2,300	2,300	2,300	2,300
Tribal Native Plant Conservation	-	-	230	230	230	230	230
Improve Livestock Management	75	220	220	390	220	390	125
Range Improvements	192	192	576	699	336	336	192
Prescribed Fire, Range	120	120	272	272	122	272	270
Riparian Restoration	32	32	96	96	96	96	56
Road Closures, Range	50	50	50	114	50	76	114
Commercial Timber Harvest	51,750	41,050	73,060	61,360	90,480	39.650	28,275
Pre-commercial Thinning	11,250	9,000	15,000	19,125	16,125	16,500	5,850
Prescribed Fire, Forest	3,720	3,720	7,350	11,100	6,450	9,150	7,230
Watershed Restorations	2,925	6,552	6,552	9,867	6,653	8,346	2,948
Road Closures, Forest	432	641	1,759	2,078	882	1,796	1,204
TOTAL	**81,497**	**73,675**	**135,850**	**138,234**	**149,175**	**111,073**	**73,997**
Restoration Activities subtotal	71,046	62,077	110,055	111,861	12,334	78,532	48,824

[1] The cost estimates shown in this table do not comprise the total federal cost to implement an alternative. Costs were estimated only for Forest Service and BLM management activities described in Chapter 3, such as riparian restoration and integrated weed management. These costs vary by alternative and provide one of many ways to compare alternatives. Other costs were not calculated as of the printing of this chapter, but were subsequently generated and used in selection of the Preferred Alternative. These include, but are not limited to, costs to other Federal agencies (for example costs to the National Marine Fisheries Service, U.S. Fish and Wildife Service, and Environmental Protection Agency for collaboration and consultation required under the Endangered Species Act, Clean Water Act, or Clean Air Act), administrative costs of the Forest Service and BLM, research costs, and wildfire supression costs.

[2] Cost for Alternative 6 is the highest because EM-S1 requires all sub-basin reviews to be completed in one year for that alternative, one-third of subbasin reviews in one year for Alternatives 3, 4, and 5; and prior to initiating management activities for Alternative 7.

Table 4-66. Relative Cost Sensitivity for the Alternatives, UCRB Planning Area.

	Alternative 1	2	3	4	5	6	7
				thousands of dollars			
Sensitivity Analysis on Funding Increases							
Highly	10,824	$11,889	$24,000	$26,282	$20,846	$24,422	$21,071
Moderately to Highly	3,534	7,453	15,276	18.,910	14,500	20.257	10,928
Moderately	15,165	13,060	22,842	30,887	22,917	26,312	13,475
Low	51,497	73,675	73,732	62,155	90,912	40,082	28,523
Total	**81,947**	**73,675**	**135,850**	**138,234**	**149,175**	**111,073**	**73,997**
				percent			
Percent Distribution of Sensitivity							
High	13	16	18	19	14	22	28
Moderate to High	4	10	11	14	10	18	15
Moderate	10	18	17	22	15	24	18
Low	64	56	54	45	61	36	39
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**

This table applies to the UCRB planning area.

UCRB Chapter 5

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Bill Morris
Chairman Morrow, Goodin County
Claire Moseley - R.M.O.G.A.
Gary Moser
Pat Moser
Harvey Moses, Jr. - Colville Confederated Tribes
Ronald Mueller
Bob Mullenix
Barbara Mullin - Montana Department of Agriculture
Russell & Sonya Munday
Betty Munis - Idaho Forest Products Commission
Lewis A. Munson - ID Department of Parks and Rec.
Chris Murphy
Roy Muth - International Snowmobile Ind. Assn.
Gary Macfarlane
Herb Malany
Mel Manning
Bryan Marotz - Montana Fish, Wildlife, and Parks
Charles A. Martell
Orville Mayer
Joni McCorey
Bill McLaughlin - University Of Idaho
Kemper Mcmaster - U.S. Fish and Wildlife Service
Anne Merkley - Sierra Club
Marlene & Richard Midstokke
Roy Mink -
Glen Moffat
Jerry Morphy
Bob Morton
Don Murphy - USDA, Forest Service Region 4
Wanda Murphy
Jewell Naffviger
Joe Nagel - Division of Environmental Quality
Chairman Nance, Minidoka County
Tony Nash
Stephen Neal
William G. Neibaur
Lyn Neilson - Montana Department of Fish, Wildlife, and Parks
Don L. Nelson
Dusty Nelson

Keith S. Nelson
Lloyd Nelson
Matt Nelson
Meg Nelson - Clark Fork Coalition
George & Dortha Neuberg
Wayne Newcomb - Bonner County Courthouse
Steve Newman - Tabacco Valley News
Charles Newton
Wayne Nicholas - Bear Creek Log Homes
Dennis Nicholls
Dorian Nicholson
Clayton Nielson - Magic Valley Bowhunters Assn.
Doug Nilson - Sierra Club
Phil Nisbet - Grassroots for Multiple Use
Terry Nobles
Laird Noh - Resources and Environment Comm.
Paul R. Nordwall - Caribou National Forest
Janet L. Nordwick
Judy Noritake - Pacific Rivers Council
Diane Norman
Steve Normington
Linda Norris - Office of Congressman Crapo
Nancey R. Norsen
Lindsay Nothern - Idaho Farm Bureau
Mike Nugent - Idaho Legislative Council
Don & Carolyn Nuxoll
Don Nystrom
Dave Nelson
Kent Nelson
Patricia & Robert Nelson
Larry New
Fred Noland
Donna Nyrehn
Janet O'Crowley - Connecting Point for Public Lands
Robert T. O'Leary - Montana Power Company
Ted O'Neal
Hugh O'Riordan - Givens, Pursley & Huntley
Steve Oates - Dept. Of Canadian Heritage
Charles Odegaard - National Park Service
Harvey Olberding
Terry Oliver - Seda-Pine Veneer
Rick Ollinger
Brett Olsen - Montana State University
Jim Olsen
Chairman Olson, Valley County
Darrell Olson
Earl Olson
Keith Olson - Montana Logging Association
Robert Olson
Robert Olson, M.D. - Valley Medical Center
Nolan Oman
Chairman Opp, Canyon County
Marcie Jo Oppenheimer
Florence Ore - Concerned Citizens of Pony
Bradford Orme
Rich Orme
Mike Orr
Bill Orton - Member, U.S. House of Reps.
Dr. John Osborn - Inland Empire Public Lands Council
Harold & Sandra Osborne
Bobby Owen - Flathead Transboundary Council
Tom Owen - Resources Limited
David Own - Montana Chamber of Commerce
Tom Olson
Wes Olson
Harry Owens
Charles Pace
David & Bernice Paige - Idaho Trails Council
Charley Parke
Fred Parker
Jean Parker
John Parker
Ron & Sharon Parker
David Parrish
Neal Parsell
Greg Parsons
Marietta Pascual
Rolland Patrick - Devil Creek Ranch
Liz Paul - Idaho Rivers United
Steve Paulson
Ethel Peck
John Peevey
Lloyd Peiffer
Don, Ned & Arleen Pence - Assoc. Logging/
ID Women in Timber
Sam Penney - Nez Perce Tribal
Wayne Persons
John Peters
Steve Petersen
Robert & Mona Peterson
Valerie Peterson
William/Georgia Peterson
James Phelps - Montana Audubon Society
Rick Philips - Soil Cons. District
Tom & Cindy Picciano
Earl Picket
Don Pickett
Andrew Pilskains
Tom Platt - Alliance for the Wild Rockies
Kim Pluid
Ray Poe
Denny Pomerleau
C.W. Pomeroy
Jeff Pool - Dames & Moore
Ron Porter - Bitterroot Conservation District
Ronald Porter - Porterbilt Post & Pole Company
Alan Posey
Ken Postma
Margaret Powell
Naomi Powell
Steve Powell
Robert F. Powers
Rich Prang - Stanley-Sawtooth Chamber of Comm.
Donna Prickett

Richard Prodgers
Lowell Prunty - Murphy's Hot Springs
David A. Pugh - National Park Service
James Purcell - Georgetown Lake
Maurice Pare
Mike Pendergrass
Larry Pennington
Deborah Perkins
Mona Peterson
Thomas Pettit
Carl Pfaff
Adrian Pfisterer
Del Piece
Gene Pierson
Robert A. Pirg
Roger Poirier
Geoff Poole
Ken Postma
Mike & Kathy Poulton
Randy Powell
John Pretty - Top Crow Tribal Cultural Committee
Johathan Procter
Frank Prunty
Mel Quale - Magic Valley Trail Machine Association
Mike Quigley
Gary Qualmann
George Quick - Northwest Timber Resource Council
Governor Marc Racicot - Office of the Governor
Mark Rafaneill
Lynn Rainbolt
Erval Rainey
Vern Ravenscroft
Kelly Rayson
Whitfield Reaves
Bruce Reay
Tye Reay
Erin Reed
Jason Reichel
Shirley Reimann
Dave Reinke
Chairman Renfrow, Camas County
Fritz Rennebaum - BLM, Salmon/Clearwater Districts
Paul Resnick - Shepp Ranch
Alan Reynolds
Duane Reynolds
Gima Rice - Wood River Chapter, ICL
Tammy Rice
Jack Rich
Gary Richardson - T.W.S.
David Richerson
Rick Richins - RTR Resource Management, Inc.
Kristy Richmond
Ryan Rickerts
Ilene Riddell
Commissioner Riddle, Elmore County
Chairman Ridley, Jerome County
Tom Rieger - Salmon Intermountain, Inc.
Chairman Rigby, Bear Lake County
Jim Riley - Intermountain Forest Industry Association
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Barbara Ristow
Dave Rittenhouse - Boise National Forest
Dan Ritter - Moose Creek Ranger District
Don Rizzi
Chuck Roady
John Roberts
Edward Robertson - Idaho Wildlife Federation
Rosholt Robertson
Shaun Robertson - Shoshone-Bannock Tribes
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Mr. & Mrs. Robinson
Steve Robinson
Michael Robison - Lewis County Weed Control
Jim Rochure - Weyerhauser Company
Sue Rodriguez-Pastor - Biodiversity Legal Foundation
Bob Rohrer - Idaho Transportation Department
Charles Roland
Allen Rollins
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Wesley Rose - Idaho Fish & Game Commission
Barry Rosenburg - Inland Empire Pub. Lands Council
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Dick Rush - Agricultural Stabilization
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Don Samuelson
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Forrest Sanderson - Lake County Courthouse
Duane Sandin
Dean Sangrey - Idaho Outfitter & Guide
Ronald Santi - Equitable Resources Energy Company
Howard Santley
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Robert Schrenk - Kootenai National Forest
Randy Schroeder - Greystone
Scott Schroeder - Stimson Lumber
Lizzie Schueler - ICL
Wallace Schwass
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Bruce Scott
Mike Scott - White Cloud Outfitters
Mary Scurlock - Pacific Rivers Council
Gary Secrist - Lazy Three S Ranch, Inc.
Jesse Sedler
Liz Sedler
Jack See - Redfish Lake Lodge
Chairman Seibold, Minidoka County
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Jeff Sells - Bonner City Daily Bee
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Gene Sentz
Scott Settle
Bill Seybert - Golden Sunlight Mines
Robert Shackelford
William M. Shepard - Minerals Exploration Coalition
Paul & Dawn Shepherd
Roy Shepherd
Frank Sherman - ID Department of Water Resources
Lillie Sherwood
Mike Shirley - Bogus Basin
Terry Shook
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David Siebanthaler - TWS
Gary Sieren
Dan Silver, M.D.
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William & Gail Simmons
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Jim Skinner - Lemhi Co. Cattle & Horse Growers
Cyril Slansky - Idaho Trails Council
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Chairman Smith, Boundary County
Clarence Smith
Commissioner Smith
Delma K. Smith - Winfred Kimber Estate
Elmer Smith
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Jeffery J. Smith
Minie Smith
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Stan Smith - Small Loggers Council
Nolan Smith & Family
Colleen Snyder - C.G.N.W.
Gerry Snyder
Mike Snyder - USDI/National Park Service
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Jerry Sorensen
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Debbie Stanton - IGR, Clearinghouse Manager
Mark Stark - Stanley Basin Cattle Association
Norm Steadman
Richard Stearns
Bob Steed - Division of Environmental Quality
John Steinmetz - Montana Bureau of Mines & Geology
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John & Amy Stevens - ICL
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Don Stockton - Idaho Department of Lands
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Sharon L. Stratton
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Mary Sloan
Elwin J. Smith - People for the West
Julian Smith
Larry Smith
Rep. Liz Smith
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Truax Soli
Paul Sommerfield
Clyde Sproul
Dori Stechley - People for the West
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Jim Szparza - Regional Ecosystem Office
M. Tae
Richard Tag
Rich Talbott
Richard Tamblyn
Herbet Tanner - Tanner & Tanner Enterprises
Jay M. Tanner - Della Ranches
Terry Tanner - Flathead Cultural Committee
Allen R. Tanner - Family Harvey Tanner
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Rob Taylor - Seattle Post Intelligencer
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Gerald Tews
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Loren Thomas - Idaho Transportation Department
Norm Thomas
Tim Thomas
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Mike Thompson - Montana Department of Fish, Wildlife, and Parks
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Trent Thurston
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Keith Tinno - Shoshone-Bannock Tribes
Paul Calverly/Tom Christensen
Robert Tomich
David Tower - Grosue Creek Ward
Nevoy & Bryce Tracy
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Spence Trogdon - Montana Outfitter & Guide
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Jeanne Tuergeon
Ed Tulloch
Russ Turner
Donna Turnipseed
Merritt Tuttle - N.M.F.S.
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Malcom Thompson
Jim Tilmant
Corky Torrey
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Frances Tupper
Scott Turner
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Cutler Umbach
Thomas Uphill
Ivan Urnovitz - Northwest Mining Association
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Bill Van Norman - Van Norman Ranches
Robin & Ben Van Norman - Van Norman Ranches
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John Vanderwalker
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Derek Volkart
Mike Vashro
Larry Waddell
Loyle V. Wahsm
Mr. & Mrs. Wakeland
Enid Gren Waldholtz - Member, U.S. House of Reps.
Carla Waldron
Chairman Walker, Madison County Commissioner
John Walker - Challis City Hall
Rick Walsh - Montana Power Company
Steve Wandrus
Tom Wardlaw
Smut Warren - Bunky Ranch
William A. Warren
Norm Wasson - Nez Perce Tribe - Fisheries
Harold Watkins
Ruth Watkins - Tri-State Council
Greg Watson
Mark Weadick - Idaho Department of Lands
Kristy Webb - Wildlife Society
David, Bud & Greta Webber
Regan Weeks
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Dave Wester - Montana State Office
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Jim White - Idaho Fish and Game
William White
Dr. Kenneth Wiesinger
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George Willhelm
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Roger Williams
Roger Williams - Idaho Trails Council
Thomas & Mildred Williams
Stan Wilmoth - State Historic Preservation Society
Chairman Wilson County
Felicite Wilson
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Larry Wilson
Luther S. Wilson
W.D. Wilson
Wendy Wilson - Idaho Rivers United
Judy Wing - Pao Blue Mountain
Wendi Winward
J. R. Wolf - Continental Divide Trail Society
Andy Wones - Jones & Stokes Associates
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Marilyn Wood
Dick Woodard - Ada County Fish & Game League
Lyle Woodbury
Scott D. Woodbury
Clarence Woodcock - Flathead Culture Committee
Wesley & Jo Ann Woodgerd
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Ken Wynn
Lenore Waldel
Bethame Walder
Robert Walker - Bonneville Power Administration
Francis Wallace
Robert Webber - Advanced Concepts International
Jerry Welatt
Larry White
Randolph Wickers - USAF
Rober Wiederrick
Earl Wilcox
Alberta Wilderrick
George Wilhelm - People for the West
Ed Williams
John Williams - Bonneville Power Administration
Linda Williamson
Ralph Wilson
Ron Wise
Jerry Wolcott - Plum Creek Timber
Lyle Woodbury
Philip Wyncoep
Patrick Yasenak
Gray Young
Tom L. Yalomella
Bernie Zaleha - TWS
Pete Zamljak
Bill Ziegert
Bob Zimmerman
Don Zuck
Johnson Tuning Fork Ranch
Missoula Public Library
Gil Alexander - Canyon Ferry Limnological Institute
John Beardsley
Lars Bergstrom
John W. Best - Deerlodge Snowmobile Club
Bill Blount
Kevin Boling
Deborah Boots - Cabinet Resource Group
Cassandra Botts - Boise Cascade Corp.
Ken Briggeman
Ellis & Kathy Bryngelson
Barb Buentemeier - Montana Women in Timber
Bob Bushnell - Montana Snowmobile Association
Vern Bromgard

Jason Campbell - Montana Stockgrower Association
Curtis Cannell
Tom Caples
Frances Cassirer
Bill Chandler - Stone Forest Products
Sid Clark - Silvi-line
Patrick Connell
Richard Connor Jr. - Pine River Lumber Co., Ltd.
Fred Crisp
John Crouter
Terry Cundy - Potlatch
Neal Christiansen, Freemont County Commissioner
Judy Clayton Cornell
Elna Darrow
Mr. & Mrs. James L. Denison
Marilyn L. Dinger
V. Dipalma
Calli Daly
Clarence & Jean Elle
Paula Easley, C/O Municipality of Anchorage
Earl J. Ferguson - Nez Perce County Commissioner
Dean Finch
Chris Gertschen - Sawtooth Science Institute
Doug Goodall
Alva D. Greene - Greene Valley Retreat
Gary Gadwa
Mathew Gouent
Richard J. Hallisy
David Hawk Jr. - Simplot Co.
Wayne A. Hedman
Steve Hilliard - Skagit County Weed Control
Bill Hutchinson
Twila Hornbeck
Mrs. William Immonen
Will & Vangie Ingram
Alex & Julia Irby
Heather Irby - Congressman Helen Chenoweth
Tim Jackson - Idaho State Journal
Kevin Johnson - Highland Rose Contracting
Shawn Keough - Sandpoint Chamber of Commerce
Patricia Klahr
Mary Ann Knight - Sawtooth Backcountry Horseman
Ferne & Bob Krumn
Norman Lefever
Ernie Lombard - N.O.H.C.C.
Mrs. Stanley Lukens
Ted Macey - Salmon River Electric Co-op, Inc.
Forrest G. Mccarthy
Bill Middleton
Bob Mitchell - BLM - Idaho State Office
Kelley Mitchell
William Morris
Don Morrow
Bill Mulligan - Three Rivers
Dolores Mazurik
Carl Nellis
Christians Neal
Merlyn Nelson
Bill O'Brien - Montana Dept. Of Natural Resources
Fred Omodt
John E. Pierotti
Marti Peck
Kelley Pezeshki - Clearwater Biodiversity Project
Adam Ruben
Rick & Jody Sandru - Ruby Valley Stock Association
James G. Senecal - Senecal Fencing
Donald Serba-Pulp & Paperworkers Resource Council
Perry Silver
Victor Simpson
Wayne Stanford
Wendell Stark
Steve Stefano
David Streufert - Powell County Extension
Steve Stuebner
George H. Swan - Swan Land & Livestock
Christopher Shelton
Bert Silcock
Paul Torrence
Gary Ullman - Louisiana Pacific Corporation
James & Sandra Unger
Bruce Vincent - Communities for Greater NW
Bethanie Walder - Road Removal Implementation Project
Eugene & Lois Walsh
Al Wells
Paul Werner - ICL
Lena Whitson
Peter Wilson
Lawrence & Jane Yazzie

Organizations and Individuals Receiving full UCRB Draft EIS

American Wildlands
BLM - Bennet Hills Resource Area
BLM - Elko District Office
BLM - Monument Resource Area
BLM - Salt Lake District Office
BLM - Shoshone District Office
Elko County Commissioners
Eureka Co. Public Land Advisory
Eureka Chamber of Commerce
Eureka County Commissioners
Eureka County Director of Public Works
Eureka County District Attorney
Eureka County Public
Forest Service - Lowman Ranger District
Kootenai Environmental Alliance
National Marine Fisheries Service
Newmont Exploration Limited

John Aaron
David Adair
Chairman, Adams Cassia County Commisioner
John R. Adams
Diane Prorak/Al Poplawsky
Jay Anderson - Idaho State University
Jim Andrae - Agri-Beef
James Andreason County Commissioner
Jeff Ankney
Mike Antrobus - Elko Daily Free Press
Vic Armacost
Debbie Austin - Beaverhead-Deerlodge Ntl Forests
Michael D. Axline - Western Environ. Law Center
Billy Alder - Custer County A.O.G
Robert Amidon
Brian Amme - BLM State Office - Nevada
Rick Applegate - Trout Unlimited
Rod Ariwite - NW Band of Shoshoni Nation/Tribe
Cindy Bachman
Don Bachman
William Back - Shoshone-Paiute Tribe
Cathy Baer - Sawtooth Wildlife Council
G. Bain - U.S. EPA Office
Robert Bancroft - Fdtc Inc.
William J. Barmore, Jr.
Richard Barnes
Alan Barta
Paul Bartlett - Roots
Doug Barto
Chairman, Bass Owhyee County Commissioner
Rick Bass
Al Beauchene
Jared Bedke
George T. Bennett
Scott Benson
Richard Beyers
Bill Bladt - Sapphire Realty
Tom Blanchard
Steve Bliss
Terrie & Dan Blomquist
Dr. W.A. Bloo - Glacier Institute
Dr. Marshall Bloom - Trout Unlimited
Dale Bob - AFSEE
Dale Bosworth - Forest Service, Region 4
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Mrs. E.T. Bovee
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Judy Boyle - Washington Co. Oversight Comm.
Ernest Bratley
Craig Brengle - U.S.Corp of Eng. Albini Falls Project
Alan Bright - Washington State University
Fred & Judy Brossy
Greg Brown
Howard Buettgenbach
Dale Burk - Stoney Dale Press
Fred and Pat Burnell
David Byrnes
William Bachman - Croman, Inc.
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Guy Baier - People for the West
Hale Bailey
Dick & Betty Baker
Doug & Cheryl Baker
Jeanne Baker - Blackfeet Tribe
John Balliette
Mary Barraco
Steve Bauer - EPA, Idaho Operation Office
Mike Baughman
Jim Baumann
Keith Bennett
Kenneth Benson
John E. Bentley
Pattie Berger
Douglas H. Boggan
Doug Bohn - Mt. Fed. Land Coalition
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Don Bowman
Michael Bowman
Bert Brackett
James M. Brady
Agnes Brailsfor
Robert Brammer
Ric Branch
Richard Brandau
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Laura Brown - USDI, Office of the Solicitor
Linda Brown
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Randy Buck
Charles H. Burley - NW Forestry Association
Denver P. Burns - USDA, Rocky Mt/Int Mt Res. Center
Paul Callahan
Charles V. Campbell
Lennet Cantwell
D.C. "Jasper" Carlton - Biodiversity Legal Foundation
Forrest Carpenter - USFS.
Barry Carter - Blue Mt Native Forest Alliance
Michael Carter
Craig Chase - Technology & Eng. Management
Richard S. Christenson - Morris and Wolff P.A.
Stew Churchwell - Friends of the West
Darrell Clarimont
Michael Clark - Greater Yellowstone Coalition
Nova Clarke
Bob Coats Guy - Bennett Lumber Co.
Patrick Coffin - U.S. Fish and Wildlife
Audrey Cole - ID Division Environmental Quality
Pete Cole
Mark Collinge - USDA AHIS/ADC
Clark Collins - Blue Ribbon Coalition
Adena Cook - Blue Ribbon Coalition
Jeff Cook - ID Department of Parks & Recreation
Ron Cooper - Pacific Rivers Council
Duane Cross - Croman Inc.

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Jay Carlson - BLM, Owyhee Resource Area
Lee Carlson - Yakama Indian Nation/Tribe
Earl Carnagey - BLM, Idaho State Office
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Jim Champie
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Murray Christman - Mt. Revelstoke/Glacier National Parks
Bill Clark
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Ken Conley
Leroy Cook - BLM, Big Butte Resource Area
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Bob Decker - Montana Wilderness Association
Rich Del Carlo - Boundary Co. Weed Control
Lori Deluca - S.A.I.C.
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Bert Doughty - Thompson Creek Mining
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Kim Davitt - American Wildlands
Alan Dibb - Kootenai National Park
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Bob Einhause
Mark Eliot
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Ken Evans - Kle Enterprises, Inc.
Mark Eames - National Marine Fisheries Service
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Leroy Etchegaray
Henry Etcheverry
Rod Evans
Murray D. Feldman
Craig Fellin
Jennifer Ferenstein - Alliance for Wild Rockies
Denzel Ferguson - Society Advocating National Ecosystems
Michael L. Fish - Weyerhaeuser
Sam & Denise Fodge
Roy France/Day - National Wildlife Federation
A.L. Freese - Libertarian Party
Stephen Freiburger - Jub Engineers Inc.
Earl Frizzell
Larry Fryberg - Idaho Department of Lands
Jay E. Fuller - Jay E. Fuller Construction Company
Richard Furman - Idaho Department of Lands
William Felts - Thompson Creek Mining Company
Mark S. Fetzer - Ecology & Environment
Chuck Finan - Coeur D' Alene Tribal Headquarters
Allan Fitzsimmons
Joan Frey County
Chuck Galloway
Craig Gehrke - The Wilderness Society
Walt Gentis - Malheur Lumber Company
Jim Gerber
Doug Glevanic - USDA, Forest Service Region 1
Greg Gollberg - Idaho Conservation League
Tom Goodall - Boise Cascade Corporation
Steve Gorton - The Montanian Newspaper
Bill Graham - ID Department of Water Resources
Win Green
Dr. Carol Griffin - The Henry's Fork Foundation, Inc.
John Grove - Friends of the Bitteroot
Jim Gallagher
Denise Gardner
Chad Gibson
Terry Gibson
Wayne Gillespie
Steve Gniadek - Glacier National Park
Doug Gochnour - Clearwater National Forest
Pete Goicoechea
Ralph Goode - Salish and Kootenai Tribes
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Patrick Heffernan - Montana Logging Association
Dan Heilig - Wyoming Outdoor Council
Leland Heinrich - Valley County Clerk
Joe Helle - Montana Woolgrowers Association
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William V. Hall - Hall & Associates
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Larry Hamilton - BLM, Montana State Office
Helen Hankins - BLM, Elko District Office
Steve Hansen
Martin Hanson
Dave Harmon - BLM, OR/WA State Office
John Haxby
Brace Hayden - Glacier National Park
Ralph Heft - BLM, Vale District
Bob Heidemann - BLM, Upper Columbia-Salmon Clearwater
Kathleen Hellman
Jeanne Herman
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Lahsha Johnston - Wilderness Society
Chuck Jones - Simplot Land & Livestock
Loring Jones - Idaho Native Plant Society
Jim Jordan
Jeff Juel - The Ecology Center
Peter Janss
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Mark Johnson - BLM, Upper Columbia-Salmon Clearwater
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Steve Kelly - Montana Ecosystems Defense Council
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Kirk Koepsel - Sierra Club
Michael C. Kossow - Meadow Brook Consv. Assn.
Becky Kramer - Union-Bulletin
Ron Kay - BLM, Deep Creek Resource Area
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Bryan Kenworthy - Hagerman National Fish Hatchery
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Jerry Kidd - BLM, Lower Snake River District
Gene Kinch - BLM, Rock Springs District Office
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Harry Lafriniere - Missoula Electric Co-op
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John Lawson - FMC Gold/Beartrack Mine
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Tom Loder - Hydrometrics Inc.
Bob Loucks - University Of Idaho C.E.S.
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Bob MacDonald - Kootenai County Commissioners
Walter Maendl - Greene Valley Retreat
John Magnus - Independent Montana Miners
David Maki
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Area Manager - BLM, Dillon Resource Area
Darrell Sall - BLM, Garnett Resource Area
District Manager - BLM, Salt Lake District
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Jacquie Moore
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Kathaleen S. Morse
Charles Morton - So. Carmen Grazing Allotment
Dewitt Moss - Northside Canal Co.
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Falma Moye
Carol Mueller - People for the West
Phil Murdock
Michael Murray - Ecocentric Wildlands Mgt. Institute
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Steve Meloche - Lincoln County Economic Development Council
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Ivan Posey - Shoshone Business Council
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Robert Rebholtz Jr. - Agri Beef Company
Jerry Reese - Targhee National Forest
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Roger Singer - Middle Snake Group Sierra Club
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George Swallow
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Steve Thompson - Montana Wilderness Association
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Jerry Todd
Dr. Dale Toweill - Idaho Fish and Game
Bill Towey - Kalispel Tribe
Prof. Michael Treleaven - Gonzaga University
Connie Tucker
Richard Tyacke - Hide Creek Ranch
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John Urguidi
Tomas Vachuda
Dave Van De Graaff - Boise Cascade Corporation
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Bill Vogler - WA State Association of Counties
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Pete Vanwyhe - BLM, Burley District Office
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Jim Weber - Columbia River Inter-Tribal Fish Comm.
Rick Weholt
John C. Weidman
Lori A. Weller - Idaho Women in Timber
Gordon White
Carol Whittaker
Paula & James Whittaker
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Federal Agencies Receiving Full UCRB Draft EIS

Environmental Protection Agency - Office of Federal Activities, Nepa Compliancy Division, Washington, DC

Department of Interior - Office of Environmental Policy and Compliance, Washington, DC

Department of the Interior - Office of Public Affairs, Washington, DC

Department of the Interior - Natural Resources Library, Washington, DC

Department of the Interior - BLM Director, Washington, DC

Department of the Interior - Bureau of Mines, Branch of Mineral Assessment, Washington, DC
Bureau of Mines, MS-5090 - Intermountain Field Oper. Center, Denver, Colorado

Bureau of Reclamation - Denver Federal Center (D-150), Denver, Colorado

Department of the Interior - Fish and Wildlife Service, Washington, DC

Department of the Interior - Offshore Environmental Assessment Division, Washington, DC

National Park Service (MIB 1210) - Environmental Quality Division - 774, Washington, DC

Department of the Interior, U.S. Geological Survey - Environmental Affairs Program, Reston, Virginia

Department of Agriculture - Office of Environmental Coord., (Chief, 1950), Washington, DC

Office of Deputy A/S of the USAF - Environment, Safety, Occupational Health, Washington, DC

HQ-USAF/LEEV - Environmental Division, Washington, DC

Army Corps of Engineers - North Pacific Division, Portland, OR

Department of Energy - Office of Environmental Compliance, (EH-23), Washington, DC

Environmental Review Coordinator - EPA Region VIII, Denver, CO

Environmental Review Coordinator - EPA Region IX, San Francisco, CA

Environmental Review Coordinator - EPA Region X, Seattle, WA

USDA - National Agriculture Library - Head, Acquisitions and Serials Branch, Beltsville, MD

Rural Development Administration - Region VIII - Western, Klamath Falls, OR

U.S. Department of Agriculture - Environmental Coordinator of Ecological Sciences Division, Washington, DC

NOAA Ecology and Conservation Office - Washington, DC

Deputy Assistant Secretary of Defense (E) - Arlington, VA

Equal Employment Opportunity Commission - Personnel Management Services, Washington, DC

Federal Energy Regulatory Commission - Environmental Compliance Branch, Washington, DC

General Services Administration - Office of Planning and Analysis, Washington, DC

Interstate Commerce Commission ICC, Washington, DC

Northwest Power Planning Council - Portland, OR

National Marine Fisheries Service - Head Quarters Office of the Administrator, Washington, DC

National Marine Fisheries Service - Juneau, AK

National Marine Fisheries Service - Seattle, WA

National Marine Fisheries Service - Seattle, WA

National Marine Fisheries Service - Silver Spring, MD

National Marine Fisheries Service - Boise , ID

National Marine Fisheries Service - Northwest Region, Habitat Conservationists Division, Portland, OR

Glossary

This glossary provides definitions for selected terms and concepts as they are used in this EIS. For more precise technical definitions, consult the Science Integration Team documents.

Abiotic ~ Non-living (refers to air, rocks, soil particles, etc.).

Adaptive management ~ A type of natural resource management in which decisions are made as part of an on-going process. Adaptive management involves testing, monitoring, evaluation, and incorporating new knowledge into management approaches based on scientific findings and the needs of society. Results are used to modify management policy.

Air pollutant ~ Any substance in air that could, if in high enough concentration, harm humans, animals, vegetation, or material. Air pollutants may include almost any natural or artificial matter capable of being airborne, in the form of solid particles, liquid droplets, gases, or a combination of these.

Air quality ~ The composition of air with respect to quantities of pollution therein; used most frequently in connection with "standards" of maximum acceptable pollutant concentrations.

Allotment (grazing) ~ Area designated for the use of a certain number and kind of livestock for a prescribed period of time.

Allowable Sale Quantity (ASQ) ~ On a National Forest, the quantity of timber that may be sold from a designated area covered by the forest plan for a specified time period.

Alluvium ~ General term for clay, silt, sand, or gravel deposited in the bed of a stream during relatively recent geologic time, as a result of stream action.

Alternative ~ In an EIS, one of a number of possible options for responding to the purpose and need for action.

Ambient air ~ Any unconfined portion of the atmosphere: open air and surrounding air. Often used interchangeably with "outdoor air".

Amenity ~ Resource use, object, feature, quality, or experience that is pleasing to the mind or senses; typically refers to values for which monetary values are not or cannot be established, such as scenic or wilderness values.

Anadromous fish ~ Fish that hatch in fresh water, migrate to the ocean, mature there, and return to fresh water to reproduce; for example, salmon and steelhead.

Animal Unit (AU) ~ Considered to be one mature cow of approximately 1,000 pounds, either dry or with calf up to 6 months of age, or their equivalent. This concept is based on a standardized amount of forage consumed.

Animal Unit Month (AUM) ~ The amount of feed or forage required by one animal unit grazing on a pasture for one month. An animal unit is one mature cow plus calf, or one horse, or five domestic sheep.

Annual (plant) **~** A plant whose life cycle is completed in one year or season.

Aquatic ~ Pertaining to water.

Aquatic ecosystem ~ A natural system based on a body of water (such as a stream, lake, or estuary) with its aquatic organisms and non-living components.

Aquifer ~ Rock or rock formations (often sand, gravel, sandstone, or limestone) that contain or carry groundwater and act as water reservoirs.

Areal ~ Pertaining to area.

Arid ~ Dry; regions or climates that lack sufficient moisture for crop production without irrigation.

Aspect ~ The direction the slope of a hillside or landform faces (for example, a slope with a southern aspect faces the south).

Assessment ~ The collection, integration, examination, and evaluation of information and values.

Asssment of Ecosystem Components (AEC) - See *Scientific Assessment.*

Attainment area ~ A geographic area that is in compliance with the National Ambient Air Quality Standards. An area considcred to have air quality as good as or better than the national ambient air quality standards as defined in the Clean Air Act. An area may be an attainment area for one pollutant and a nonattainment area for others.

Band ~ A band is a group of people who share a culture, territory, and sense of mutual recognition. Bands are primarily those pre-treaty-making-period American Indian groups.

Bankfull width ~ The width of a stream channel measured between the tops of the most prominent banks on either side of the stream. Also refers to the width of the stream at the normal flood flow.

Basal area ~ (1) In forests, the cross-sectional area of a tree trunk measured at breast height (4.5 feet), usually expressed in square feet per acre. (2) On rangeland, the cross-sectional area of the stem or stems of a plant or of all plants in a stand. Herbaceous and small woody plants are measured at or near the ground level; larger woody plants are measured at breast or other designated height.

Basalt ~ a finely grained, dark, dense volcanic rock.

Basin (river) ~ In general, the area of land that drains water, sediment, and dissolved materials to a common point along a stream channel. River basins are composed of large river systems. In this EIS, the term refers to the equivalent of a third field hydrologic unit code, an area of about nine million acres, such as the Salmon River basin. It also is used to refer in general to the interior Columbia River Basin.

Batholith ~ A large intrusive mass of igneous rock, usually granite.

Bedload ~ Sediment moving on or near a streambed.

Beneficial uses ~ Any of the various uses which may be made of water including, but not limited to, domestic water supplies, industrial water supplies, agricultural water supplies, navigation, recreation in and on the water, wildlife habitat, and aesthetics. The beneficial use is dependent upon actual use, the ability of the water to support a non-existing use either now or in the future, and its likelihood of being used in a given manner. The use of water for the purpose of wastewater dilution or as a receiving water for a waste treatment facility effluent is not a beneficial use.

Beneficiary ~ The recipient of payment or entitlement based upon an agreement, contract, or treaty. Indian tribes in the project area signed treaties and agreements with the United States in exchange for promises by the U.S. to secure or guarantee rights the Indians reserved in these treaties and agreements.

Best Management Practices (BMPs) ~ Practices designed to prevent or reduce water pollution.

Biogeochemical cycle ~ Natural processes (biological, geological, and chemical) that recycle nutrients in various chemical forms from the environment, to organisms, then back to the environment. Examples are the carbon, nitrogen, and hydrologic cycles.

Biological diversity (biodiversity) ~ The variety and variability among living organisms and the ecological complexes in which they occur.

Biophysical ~ The combination of biological and physical components in an ecosystem.

Biophysical template ~ The successional and disturbance processes, landform, soil, water, and climate conditions that formed the native system with which species of plants and animals evolved.

Biotic ~ Living.

Biomass ~ Dry weight of organic matter in plants and animals in an ecosystem, both above and below ground.

Board foot (bf) ~ A unit of wood 12" x 12" x 1".

Braided stream ~ A stream that flows in an interconnected network of channels.

Broadcast burning ~ Burning forest fuels as they are, with no piling or windrowing.

Browse ~ Twigs, leaves, and young shoots of trees and shrubs that animals eat.

Bunch Grass ~ A grass having the characteristic growth habit of forming a bunch; lacking stolons or rhizomes.

Candidate species ~ Plant and animal species that may be proposed for listing as endangered or threatened in the future, in the opinion of the U.S. Fish & Wildlife Service (FWS) or the National Marine Fisheries Service (NMFS). The FWS recently revised its list of candidate species (February 28, 1996 *Federal Register*). Under their new system, only those species for which they have enough information to support a listing proposal will be called candidates.

Canopy ~ In a forest, the branches from the uppermost layer of trees; on rangeland, the vertical projection downward of the aerial portion of vegetation.

Canopy closure ~ The amount of ground surface shaded by tree canopies as seen from above. Used to describe how open or dense a stand of trees is, often expressed in 10 percent increments.

Carbon cycle ~ The ecological cycle in which carbon moves from carbon dioxide in the air into organic materials in plants and animals, and returned to carbon dioxide through respiration, death and decay of tissues, or fire.

Carbon dioxide ~ A colorless, odorless gas that occurs naturally in the earth's atmosphere and is emitted into the air by fossil fuel combustion.

Carbon monoxide ~ A colorless, odorless, poisonous gas produced by incomplete fossil fuel combustion; primarily emitted by motor vehicles and other mobile sources. Carbon monoxide is a criteria air pollutant that interferes with the blood's ability to carry oxygen to the body's tissues and results in numerous adverse health effects.

Carnivore ~ An organism that eats only meat. The gray wolf is an example of a carnivore.

Carrying capacity ~ The number of animals or plants that can be maintained over a specific period of time on a specified amount of land without damage to either the organisms or the habitat.

Ceded lands ~ Lands that tribes ceded to the United States by treaty in exchange for reservation of specific land and resource rights, annuities, and other promises in the treaties.

Channel (stream) ~ The deepest part of a stream or riverbed through which the main current of water flows.

Channelization ~ Human-caused alterations to a stream channel that cause the channel to be fixed in place, such as levees, dikes, trenching, and rip-rap.

Class I area ~ Under the 1977 Clean Air Act amendments, all international parks, National Parks greater than 6,000 acres, and national Wilderness Areas greater than 5,000 acres which existed on August 7, 1977. This class provides the most protection to pristine lands by severely limiting the amount of additional air pollution that can be added to these areas.

Clearcutting ~ A regeneration harvest method that removes all merchantable trees in a single cutting except for wildlife trees or snags. A "clearcut" is an area from which all merchantable trees have been cut.

Climate ~ The composite or generally prevailing weather conditions of a region throughout the year, averaged over a series of years.

Cluster ~ In this EIS, refers to a group of subbasins denoting forest and range ecosystems where the condition of the vegetation and ecological functions and processes are similar, and where management opportunities and risks are similar.

Coarse Woody Debris (CWD) ~ Pieces of woody material having a diameter of at least three inches and a length greater than three feet (also referred to as large woody debris, or LWD).

Collaborative ~ Working together.

Community ~ A group of species of plants and/or animals living and interacting at a particular time and place; a group of people residing in the same place and under the same government.

Community of interest ~ People who share a common concern but may not be located in the same place.

Compaction ~ Making soil hard and dense, decreasing its ability to support vegetation because the soil can hold less water and air and because roots have trouble penetrating the soil.

Competition ~ An interaction that occurs when two or more individuals make demands of the same resources that are in short supply.

Component ~ A part of a system.

Composition (species) **~** The mix of different species that make up a plant or animal community, and their relative abundance.

Connectivity ~ The arrangement of habitats that allows organisms and ecological processes to move across the landscape; patches of similar habitats are either close together or linked by corridors of appropriate vegetation. The opposite of fragmentation.

Conserve ~ As used in Chapter 3 of this document, refers specifically to a management emphasis on protection and maintenance of forest, rangeland, and aquatic conditions, health, and integrity, recognizing that natural processes dominate the landscape and gradual change will occur. See Chapter 3 for more details.

Conservation strategy/conservation agreement ~ Plans to remove or reduce threats to candidate and sensitive species of plants and animals so that a listing as threatened or endangered is unnecessary.

Consultation ~ (1) An active, affirmative process that (a) identifies issues and seeks input from appropriate American Indian governments, community groups, and individuals; and (b) considers their interests as a necessary and integral part of the BLM's and Forest Service's decision-making process. (2) The Federal Government has a legal obligation to consult with American Indian Tribes. This legal obligation is based in such laws as NAGPRA, AIRFA, and numerous other Executive Orders and statutes. This legal responsibility is, through consultation, to consider Indian interests and account for those interests in the decision. (3) The term also refers to a requirement under Section 7 of the Endangered Species Act for Federal agencies to consult with the U.S. Fish and Wildlife Service and/or National Marine Fisheries Service with regard to Federal actions that may affect listed threatened and endangered species or critical habitat.

Corridor (landscape) ~ Landscape elements that connect similar patches of habitat through an area with different characteristics. For example, streamside vegetation may create a corridor of willows and hardwoods between meadows or through a forest.

Cover ~ (1) Trees, shrubs, rocks, or other landscape features that allow an animal to partly or fully conceal itself. (2) The area of ground covered by plants of one or more species.

Cover type ~ The present vegetation of an area.

Criteria pollutants ~ Air pollutants designated by the Environmental Protection Agency (EPA) as potentially harmful and for which ambient air standards have been set to protect the public health and welfare. The criteria pollutants are carbon monoxide, sulfur dioxide, particulate matter, nitrogen dioxide, ozone, hydrocarbons, and lead.

Crown ~ The part of a tree containing live foliage; treetops.

Crown fire ~ A forest fire that burns in the crowns of trees.

Cultural resources ~ Remains of sites, structures, or objects used by people in the past.

Cumulative effects ~ Impacts on the environment that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

Data ~ Facts used in an analysis.

Debris (organic) ~ Logs, trees, limbs, branches, leaves, bark, etc., that accumulate, often in streams or riparian areas.

Decay (decomposition) ~ The breakdown of living tissues into inorganic component parts, usually caused by fungi or bacteria.

Degradation ~ (1) General lowering of the earth's surface by erosion or moving of materials from one place to another. (2) Reduction in value or quality.

Demographic ~ Related to the vital statistics of human populations (size, density, growth, distribution, etc.) and the effect of these on social and economic conditions.

Density (stand) ~ The number of trees growing in a given area, usually expressed in terms of trees per acre.

Desired Range of Future Conditions (DRFC) ~ A portrayal of the land, resource, or social and economic conditions that are expected to result in 50–100 years if objectives are achieved; in this document, portrayed as a range of conditions. A vision of the long-term condition of the land.

Developed recreation ~ Recreation that requires facilities that in turn result in concentrated use of an area; for example, a campground.

Direct effects ~ Impacts on the environment that are caused by the action and occur at the same time and place.

Dispersed recreation ~ Recreation that does not occur in a developed recreation site; for example, hunting or backpacking.

Disturbance ~ Refers to events that alter the structure, composition, or function of terrestrial or aquatic habitats. Natural disturbances include, among others, drought, floods, wind, fires, wildlife grazing, and insects and pathogens. Human-caused disturbances include actions such as timber harvest, livestock grazing, roads, and the introduction of exotic species.

Disturbance-recovery regime ~ Natural pattern of periodic disturbances, such as fire or flood, followed by a period of recovery from the disturbance (such as regrowth of a forest after fire).

Diversity ~ See biological diversity.

Dominant ~ A group of plants that by their collective size, mass, or number exert a primary influence on other ecosystem components.

Downed wood ~ A tree or part of a tree that is dead and laying on the ground.

Duff ~ The partially decomposed organic material of the forest floor that lies beneath freshly fallen leaves, needles, twigs, stems, bark, and fruit.

Drought ~ In refcrence to rangeland, a period without precipitation during which the soil water content is reduced to such an extent that plants suffer from lack of water. A drought year, in this EIS, refers to less than or equal to 75 percent of normally received precipitation in a year.

Dynamic equilibrium ~ A system that is maintained in a harmonious and integrated condition while continuous change, activity, or progress occurs.

Ecological integrity ~ In general, ecological integrity refers to the degree to which the elements of biodiversity and the functions that link them together and sustain the entire system are complete and capable of performing desired functions; the quality of being complete; a sense of wholeness. Absolute measures of integrity do not exist. Proxies provide useful measures to estimate the integrity of major ecosystem components (forestland, rangeland, aquatic, and hydrologic). Estimating these integrity components in a relative sense across the project area helps to explain current conditions and to prioritize future management. Thus, areas of high integrity would respresent areas where ecological functions and processes are better represented and functioning than areas rated as low integrity.

Ecological processes ~ The flow and cycling of energy, materials, and organisms in an ecosystem.

Ecological Reporting Unit (ERU) ~ In this EIS, a geographic mapping unit developed by the Science Integration Team to report information on the description of biophysical environments, the characterization of ecological processes, the discussion of past management activities and their effects, and the identificaiton of landscape management opportunities.

Ecology ~ the science of the interrelationships between organisms and their environment; from the Greek *Oikos* meaning "house" or "place to live."

Economic efficiency ~ Producing goods and services in areas best suited for that production based on natural biophysical advantage or an area's ability to best serve regional demands of people.

Economic region ~ A group of communities and their surrounding rural areas that are linked together through trade.

Economy ~ System of production, distribution, and consumption of economic goods.

Ecosystem ~ A complete, interacting system of living organisms and the land and water that make up their environment; the home places of all living things, including humans.

Ecosystem health ~ A condition where the parts and functions of an ecosystem are sustained over time and where the system's capacity for self-repair is maintained, such that goals for uses, values, and services of the ecosystem are met.

Ecosystem-based management ~ Scientifically based land and resource management that integrates ecological capabilities with social values and economic relationships, to produce, restore, or sustain ecosystem integrity and desired conditions, uses, products, values, and services over the long term.

Edge (habitat) ~ The margin where two or more vegetation patches meet, such as the boundary of a forest next to a meadow or the boundary of a clearcut next to a mature forest stand.

Emission ~ A release into the outdoor atmosphere of air contaminants.

Endangered species ~ A plant or animal species listed under the Endangered Species Act that is in danger of extinction throughout all or a significant portion of its range.

Endemic species ~ Plants or animals that occur naturally in a certain region and whose distribution is relatively limited to a particular locality. "Endemism" is the occurrence of endemic species in an area.

Environment ~ The combination of external physical, biological, social, and cultural conditions affecting the growth and development of organisms and the nature of an individual or community.

Environmental Impact Statement (EIS) ~ A statement of environmental effects of a proposed action and alternatives to it. A Draft EIS is released to the public and other agencies for review and comment. A Final EIS is issued after consideration of public comments. A Record of Decision (ROD) is based on the information and analysis in the Final EIS.

Epidemic (outbreak) ~ The rapid spread, growth, and development of pathogen or insect populations that affect large numbers of a host population throughout an area at the same time.

Erosion ~ The wearing away of the land surface by running water, wind, ice, gravity, or other geological activities; can be accelerated or intensified by human activities that reduce the stability of slopes or soils.

Ethno-habitats ~ Habitats that are socially and/or traditionally important to American Indian cultures.

Eutrophication ~ Changes that occur in a lake or other body of water due to excessive supplies of nutrients such as nitrates and phosphates, usually from runoff from the surrounding land.

***Evaluation of Alternatives* ~** Document (Quigley, Lee, and Arbelbide 1997) produced by the ICBEMP Science Integration Team, which analyzes the effects and practicality of implementing each alternative management strategy described in the ICBEMP Draft EISs.

Evapotranspiration ~ The actual total loss of water by evaporation from soil, water bodies, and transpiration from vegetation, over a given area with time.

Even-aged management ~ Method of forest management in which trees, usually of a single species, are maintained at about the same age and size and are harvested all at once so a new stand may grow.

Even-aged stands ~ Stands of trees of approximately the same age. Silvicultural methods that generate even-aged stands include clearcutting, shelterwood, and seed tree.

Exotic ~ A plant or animal species introduced from a distant place; not native to the area.

Extinction ~ Complete disappearance of a species from the earth.

Extirpation ~ Localized disappearance of a species from an area.

Fauna ~ The vertebrate and invertebrate animals of an area or region.

Federal Land Policy and Management Act (1976) (FLPMA) ~ The act that establishes public land policy primarily for the Bureau of Land Management; establishes guidelines for its administration; and provides for the management, protection, development, and enhancement of the public lands, among other provisions.

Fines (sediment) ~ Sediment particles smaller than 0.2 inch. Excessive fines can trap newly hatched fish and decrease the amount of water percolating through spawning gravels. High fine sediment loads slow plant growth and reduce available food, oxygen, and light.

Fire-dependent systems ~ Forests, grasslands, and other ecosystems historically composed of species of plants that evolved with and are maintained by fire regimes.

Fire cycle, fire frequency ~ See fire return interval.

Fire-independent system ~ Forests, grasslands, and other ecosystems whose primary natural disturbances historically were decomposition, windthrow, flooding, or other disturbances other than fire.

Fire-intolerant ~ Species of plants that do not grow well or die from the effects of too much fire. Generally these are shade-tolerant species.

Fire regime ~ The characteristics of fire in a given ecosystem, such as the frequency, predictability, intensity, and seasonality of fire.

Fire return interval ~ The average time between fires in a given area.

Fire-tolerant ~ Species of plants that can withstand certain frequency and intensity of fire. Generally these are shade-intolerant species.

First-order stream ~ Stream channel with no tributaries.

Floodplain ~ The portion of a river valley or level lowland next to streams which is covered with water when the river or stream overflows its banks at flood stage.

Forage ~ Vegetation (both woody and non-woody) eaten by animals, especially grazing and browsing animals.

Forbs ~ Broad-leafed plants; includes plants that commonly are called weeds or wildflowers.

Forest health ~ The condition in which forest ecosystems sustain their complexity, diversity, resiliency, and productivity while providing for human needs and values. It is a useful way to communicate about the current condition of the forest, especially with regard to resiliency, a part of forest health that describes the ability of the ecosystem to respond to disturbances. Forest health and resiliency can be described, in part, by species composition, density, and structure.

Forest plan (Forest Land and Resource Management Plan) ~ A document that guides natural resource management and establishes standards and guidelines for a National Forest; required by the National Forest Management Act.

Fragmentation (habitat) ~ The break-up of a large land area (such as a forest) into smaller patches isolated by areas converted to a different land type. The opposite of connectivity.

***Framework for Ecosystem Management* ~** Document (Haynes et al. 1996) produced by the ICBEMP Science Integration Team, which provides broad concepts and processes recommended for ecosystem analysis, planning, management, and monitoring at various scales.

Fry ~ A recently hatched fish, after the yolk sac has been absorbed.

Fuel (fire) ~ Dry, dead parts of trees, shrubs, and other vegetation that can burn readily.

Fuel ladder ~ Vegetative structures or conditions such as low-growing tree branches, shrubs, or smaller trees that allow fire to move vertically from a surface fire to a crown fire.

Fuel load ~ The dry weight of combustible materials per unit area; usually expressed as tons per acre.

Game species ~ Wild animals that people hunt or fish for food or recreation according to prescribed seasons and limits.

Gene pool ~ All the genetic (hereditary) information contained in a reproducing population of a particular species.

Genetic adaptation ~ Changes in the genetic makeup of organisms of a species that allow the species to reproduce and gain a competitive advantage under changed environmental conditions.

Geoclimatic setting ~ The geology, climate (precipitation and temperature), vegetation, and geologic processes (such as landslides or debris flows) that are characteristic of a place; places with similar characteristics are said to have the same geoclimatic setting.

Geographic Information System (GIS) ~ An information processing technology to input, store, manipulate, analyze, and display data; a system of computer maps with corresponding site-specific information that can be combined electronically to provide reports and maps.

Geologic/geomorphic processes ~ The actions or events that shape and control the distribution of materials, their states, and their morphology, within the interior and on the surface of the earth. Examples of geologic processes include: volcanism, glaciation, streamflow, metamorphism (partial melting of rocks), and landsliding.

Geomorphology ~ The geologic study of the shape and evolution of the earth's landforms.

Glacial till ~ Mixed rock of clay, sand, gravel, and boulders transported and deposited by glaciers.

Glaciation ~ Alteration of the earth's solid surface through erosion and deposition by glacier ice.

Goals (management) ~ In this EIS, refers to descriptions of what an agency wants to accomplish.

Gradient ~ A rate of vertical elevation change per unit of horizontal distance; also called slope.

Grazing pressure ~ The ratio of forage demand to forage available, for any specified forage, at any point in time. (Thus, as forage demand increases relative to forage available, grazing pressure increases, and vice-versa.)

Greenstripping ~ The practice of planting strips of fire-resistant vegetation at strategic locations on the landscape to slow or stop wildfires.

Ground fire ~ A fire that burns the organic material in the soil layer and the decayed material or peat below the ground surface.

Groundwater ~ Water that sinks into the soil and is stored in slowly flowing and slowly renewed underground reservoirs called aquifers.

Guidelines (management) ~ In this EIS, refers to suggested techniques, priorities, processes, or prescriptions that are useful in meeting objectives; not required.

Habitat ~ A place that provides seasonal or year-round food, water, shelter, and other environmental conditions for an organism, community, or population of plants or animals.

Habitat type ~ The land area capable of supporting a single plant association. Provides a way to classify land area.

Harvest ~ (1) Felling and removal of trees from the forest; (2) removal of game animals or fish from a population, typically by hunting or fishing.

Harvestable ~ In this EIS, with regard to American Indian tribes, refers to a population of plants or animals that is self-sustaining and capable of producing a dependable harvest annually to meet spiritual, cultural, subsistance, and commercial needs.

Headwaters ~ Beginning of a watershed; unbranched tributaries of a stream.

Healthy landscape systems ~ Those landscapes whose processes are in balance. The balance is dynamic; humans have the opportunity to work with changing landscape conditions to receive a predictable and reliable flow of both commodities and amenities. Healthy landscape systems show resiliency and have predictable responses to disturbance, while providing human values. Key ecological systems that interact in dynamic balance include: human, hydrologic-land, carbon-nutrient, food web, and evolutionary systems.

Herbaceous ~ Green and leaflike in appearance or texture; includes grasses, grass-like plants, and forbs, with little or no woody component.

Herbivore ~ An animal that eats plants, either primarily or entirely.

Hierarchy ~ A sequence of sets composed of smaller subsets.

High quality waters ~ Waters whose quality is necessary to support threatened, endangered, candidate, and sensitive species restoration, conservation, or recover; waters/watersheds used as sources of public drinking water; waters/watersheds where groundwater recharge to Sole Source Aquifers is designated under the Safe Drinking Water Act; and waters whose quality is necessary to support all designated beneficial uses.

Historical Range of Variability (HRV) ~ The natural fluctuation of components of healthy ecosystems over time. In this EIS, refers to the range of conditions and processes that are likely to have occurred prior to settlement of the project area by people of European descent (approximately the mid-1800s), which would have varied within certain limits over time. Historical conditions and processes portrayed in this EIS include such variables as: forest and range vegetation types, compositions, and structures; fish and wildlife habitats and populations; and fire regimes. For purposes of comparison to current conditions, historical conditions in this

EIS represent an estimated mid-point within the historical range of variability. HRV is discussed in this document only as a reference point, to establish a baseline set of conditions for which sufficient scientific or historical information is available to enable comparison to current conditions.

Home range - The area around an animal's established home which is visited during the animal's normal activities.

Homogeneous ~ Regular, similar; uniform throughout.

Hot spots ~ In this EIS, places where three or more areas of endemism or biodiversity intersect.

Hybridization ~ The cross-breeding of unlike individuals to produce hybrids.

Hydrologic ~ Refers to the properties, distribution, and effects of water. "Hydrology" refers to the broad science of the waters of the earth ~ their occurrence, circulation, distribution, chemical and physical properties, and their reaction with the environment.

Hydrologic cycle (water cycle) ~ The ecological cycle that moves water from the air by precipitation to the earth and returns it to the atmosphere; a varicty of processes are involved, including evaporation, run-off, infiltration, percolation, storage, and transpiration.

Hydrologic Unit Code (HUC) ~ A coding system developed by the U.S. Geological Service to map geographic boundaries of watersheds of various sizes.

Hydrophobic (soil) ~ A condition in which soil becomes water-repellant, the capacity of soil to hold water is reduced, and chances for erosion are increased.

Hydrophytic plants ~ Plants that grow wholly or partly immersed in water.

Igneous rocks ~ Rocks formed by molten lava becoming solid.

Impermeable ~ Cannot be penetrated.

Implement ~ To carry out.

Improper livestock grazing ~ Livestock grazing which results in improper use, which can be defined as a degree of utilization of current year's growth which, if continued, will not achieve management objectives and will not maintain or improve the long-term productivity of a site.

Indicator species ~ A species that is presumed to be sensitive to habitat changes; population changes of indicator species are believed to best indicate the effects of land management activities.

Indirect effects ~ Impacts on the environment that are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable.

Infiltration ~ The movement of water through soil pores and spaces.

INFISH ~ Interim Inland Native Fish Strategy for the Intermountain, Northern, and Pacific Northwest Regions (Forest Service).

Infrastructure ~ The basic facilities, equipment, and installations needed for the functioning of a system; commonly refers to such items as roads, bridges, power facilities, and the like.

In-migration ~ The movement of new residents into an area.

Instream flow ~ Flow of water in its natural setting (as opposed to waters divertcd for 'offstream' uses such as industry or agriculture). Instream flow levels provided for environmental reasons enhance or maintain the habitat for riparian and aquatic life, with timing and quantities of flow characteristic of the natural setting.

Integration ~ Bringing the values and systems of different disciplines together to address policy questions with a common framework using consistent techniques and measurement units.

Interagency ~ Involving Forest Service, BLM, and other Federal agencies.

Interdisciplinary Team (IDT) ~ A team of individuals with skills from different disciplines working together in an integrated way on the same task or project.

Intergovernmental~ Involving Federal, State, tribal, county, or other government entities.

Intermittent stream ~ A stream that flows only at certain times of the year when it receives water from other streams or from surface sources such as melting snow.

Integrity ~ See ecological integrity.

Invasion (plant) ~ The movement of a plant species into a new area outside its former range.

Invertebrate ~ Small animals that lack a backbone or spinal column. Spiders, insects, and worms are examples of invertebrates.

Irretrievable ~ A category of impacts that applies to losses of production or commitment of renewable natural resources. For example, while an area is used as a ski area, some or all of the timber production there is "irretrievably" lost. If the ski area closes, timber production could resume; therefore, the loss of timber production during the time the area is devoted to skiing is irretrievable but not irreversible, because it is possible for timber production to resume if the area is no longer used as a ski area.

Irreversible ~ A category of impacts that applies to non-renewable resources, such as minerals and archaeological sites. Losses of these resources cannot be reversed. Irreversible effects can also refer to effects of actions on resources that can be renewed only after a very long period of time, such as the loss of soil productivity.

Issue ~ A matter of controversy, dispute, or general concern over resource management activities or land uses. To be considered a "significant' EIS issue, it must be well defined, relevant to the proposed action, and within the ability of the agency to address through alternative management strategies.

Key ecological functions ~ A wide range of roles that species play in the ecosystem, such as predation, herbivory, nutrient cycling, and biomass contributions.

Key environmental correlates ~ Environmental factors that are either associated with or required by a given species, such as forest canopies, downed wood, snags, or piles of bark.

Keystone species ~ Species that play roles affecting many other organisms in an ecosystem; often are grouped according to their perceived importance to humans, such as "upland birds" or "waterfowl".

Landscape ~ All the natural features such as grasslands, hills, forest, and water, which distinguish one part of the earth's surface from another part; usually that portion of land which the eye can comprehend in a single view, including all its natural characteristics.

Landscape composition ~ The types of stands or patches present across a given area of land.

Landscape ecology ~ The study of the ecological effects of spatial patterns in ecosystems.

Landscape structure ~ The mix and distribution of stand or patch sizes across a given area of land. Patch sizes, shapes, and distributions are a reflection of the major disturbance regimes operating on the landscape.

Lethal (stand-replacing) fires ~ In forests, fires in which less than 20 percent of the basal area or less than 10 percent of the canopy cover remains; in rangelands, fires in which most of the shrub overstory or encroaching trees are killed.

Lichens ~ Organisms made up of specific algae and fungi, forming identifiable crusts on soil, rocks, tree bark, and other surfaces. Lichens are primary producers in ecosystems; they contribute living material and nutrients, enrich the soil and increase soil moisture-holding capacity, and serve as food sources for certain animals. Lichens are slow-growing and sensitive to chemical and physical disturbances.

Lifeways ~ the manner and means by which a group of people lives; their way of life. Components include language(s), subsistence strategies, religion, economic structure, physical mannerisms, and share attitudes.

Litter ~ The uppermost layer of organic debris on the soil surface, which is essentially the freshly fallen or slightly decomposed vegetation material such as stems, leaves, twigs, and fruits.

Long term ~ In this EIS, refers to a period on the order of 50 to 100 years or longer.

Lower montane ~ A terrestrial community that generally is found in drier and warmer environments than the montane terrestrial community. The lower montane community supports a unique clustering of wildlife species.

Mainstem ~ The main channel of the river in a river basin, as opposed to the streams and smaller rivers that feed into it.

Maintain ~ (1) To continue. (2) For this document, the term is intended to convey the idea of keeping ecosystem functions, processes, and/or components (such as soil, air, water, vegetation) in such a condition that the ecosystem's ability to accomplish current and future management objectives is not weakened.

Management activities may be compatible with ecosystem maintenance if actions are designed to maintain or improve current ecosystem condition.

Management direction ~ A statement of goals and objectives, management prescriptions, and associated standards and guidelines for attaining them.

Mass movement, mass wasting (erosion) ~ Large land slump, where a mass of rock or soil slips in one large unit down from a cliff or slope.

Merchantable timber ~ Timber that can be bought or sold.

Microbes ~ Microscopic organisms such as fungi, bacteria, or algae.

Microbiotic crust ~ Thin crust of living organisms on or just below the soil, composed of lichens, mosses, algae, fungi, cyanobacteria, and bacteria.

Microclimate ~ The climatic conditions within a small habitat such as: a tree stump, under a boulder, in the space between grasses, or on the side of a slope.

Migration corridor ~ The habitat pathway an animal uses to move from one place to another.

Mitigation ~ Measures designed to counteract environmental impacts or to make impacts less severe.

Mixed stand ~ A stand consisting of two or more tree species.

Mixing height ~ Measured from the surface upward. The height to which relatively vigorous mixing of air due to convection occurs.

Monitoring ~ A process of collecting information to evaluate whether or not objectives of a project and its mitigation plan are being realized.

Monoculture ~ A plant community (forest, range) consisting of only one species; uniform throughout.

Montane ~ A terrestrial community that generally is found in moderate environments between the lower montane (ponderosa pine) and subalpine terrestrial communities. Montane communities are generally moister than lower montane and warmer than subalpine, and support a unique clustering of wildlife species.

Morphology ~ Form and structure.

Mosaic ~ A pattern of vegetation in which two or more kinds of communities are interspersed in patches, such as clumps of shrubs with grassland between.

Multiple-use management ~ The management of public lands and their various resource values so they are used in the combination that best meets the present and future needs of the American people.

Mycorrhizae ~ The symbiotic relationship between certain fungi and the roots of certain plants, especially trees; important for plants to take nutrients from soil.

National Ambient Air Quality Standards (NAAQSs) ~ Standards set by the Federal Environmental Protection Agency for the maximum levels of air pollutants that can exist in the outdoor air without unacceptable effects on human health or the public welfare.

National Environmental Policy Act (NEPA) ~ An act of Congress passed in 1969 declaring a national policy to encourage productive and enjoyable harmony between people and the environment, to promote efforts that will prevent or eliminate damage to the environment and the biosphere and stimulate the health and welfare of people, and to enrich the understanding of the ecological systems and natural resources important to the nation, among other purposes.

National Forest Management Act (NFMA) ~ A law passed in 1976 requiring the preparation of Forest Service regional guides and forest plans and the preparation of regulations to guide that development.

Native species ~ Species that normally live and thrive in a particular ecosystem.

Natural areas ~ Areas managed by various landowners that are mainly in a natural state and being managed to maintain or restore a degree of naturalness for research, monitoring, inventory, habitat protection, education, or social needs.

Natural resources ~ Water, soil, wild plants and animals, air, minerals, nutrients, and other resources produced by the earth's natural processes.

Natural scenic condition ~ Naturally appearing or only slightly altered, determined by using scenery management system methods described in the USDA Agriculture Handbook 701.

New action ~ Those actions that have not been implemented, or for which contracts have not been awarded, or for which permits have not been issued. (See ongoing action.)

Niche ~ The smallest unit of a habitat occupied by an organism, and/or the role of an organism in the environment.

Nitrogen cycle ~ Cyclic movement of nitrogen in different chemical forms from the environment, to organisms, and then back to the environment.

Nitrogen-fixing ~ Ability to remove nitrogen from the atmosphere and convert it to forms that can be used by plants, animals, and microbes. Very few specialized organisms have this ability, making them critical to the nitrogen cycle.

No-action alternative ~ The most likely condition expected to exist in the future if current management direction were to continue unchanged.

Nongame ~ Term for wild animals not commonly harvested for recreation, fur, or subsistence.

Nonlethal fire ~ In forests, fires in which more than 70 percent of the basal area or more than 90 percent of the canopy cover survives; in rangelands, fires in which more than 90 percent of the vegetative cover survives (implies that fire is occurring in an herbaceous-dominated community).

Non-point source pollution ~ Pollution whose source is not specific in location; the sources of the pollutant discharge are dispersed, not well defined or constant. Examples include sediments from logging activities and runoff from agricultural chemicals.

Non-vascular plants ~ Plants that do not have vessels or ducts to conduct water and food and therefore require a moist environment for survival; mosses and liverworts are examples of non-vascular plants.

Noxious weed ~ A plant species designated by Federal or State law as generally possessing one or more of the following characteristics: aggressive and difficult to manage; parasitic; a carrier or host of serious insects or disease; or non-native, new, or not common to the United States. According to the Federal Noxious Weed Act (PL 93-639), a noxious weed is one that causes disease or has other adverse effects on man or his environment and therefore is detrimental to the agriculture and commerce of the United States and to the public health.

Nutrient cycles ~ Ecological processes in which nutrients and elements such as carbon, phosphorous, nitrogen, calcium, and others, circulate among animals, plants, soils, and air.

Objectives (management) ~ In this EIS, refers to indicators used to measure progress toward attainment of goals. They address short- and long-term actions taken to meet goals and the desired ranges of future conditions.

Old forest ~ (a) *Old single story forest* refers to mature forest characterized by a single canopy layer consisting of large or old trees. Understory trees are often absent, or present in randomly spaced patches. It generally consists of widely spaced, shade-intolerant species, such as ponderosa pine and western larch, adapted to a nonlethal, high frequency fire regime.
(b) *Old multi-story forest* refers to mature forest characterized by two or more canopy layers with generally large or old trees in the upper canopy. Understory trees are also usually present, as a result of a lack of frequent disturbance to the understory. It can include both shade-tolerant and shade-intolerant species, and is generally adapted to a mixed fire regime of both lethal and nonlethal fires.

Omnivore ~ An animal that eats a combination of meat and vegetation. Grizzly bears and humans are examples of omnivores.

Ongoing actions~ Those actions that have been implemented, or have contracts awarded or permits issued. (See new actions.)

Out-migration ~ The movement of former residents away from an area.

Overfishing ~ Harvesting of so many fish of a species, especially immature ones, that there is not enough breeding stock left to replenish the species.

Overgrazing ~ Consumption of rangeland grass by grazing animals to the point that it cannot be renewed, or can be only slowly renewed, because of damage to the root system.

Overstory ~ The upper canopy layer.

Ozone ~ A strong smelling, pale blue, reactive toxic chemical gas consisting of three oxygen atoms. A pollutant formed in the atmosphere which can seriously affect the human respiratory system.

PACFISH ~ Interim strategies for managing Pacific anadromous fish-producing watersheds in eastern Oregon and Washington, Idaho, and portions of California.

Park-like stands ~ Stand having scattered large overstory trees, few or no understory trees, and open growing conditions usually maintained by frequent ground fires.

Particulates ~ Solid particles or liquid droplets suspended or carried in the air.

Patch ~ An area of uniform vegetation that differs from what surrounds it in structure and composition. Examples might include a patch of forest surrounded by a cut-over area or a patch of dense young forest surrounded by a patch of open old forest.

Pathogen ~ An agent such as a fungus, virus, or bacterium that causes disease.

Pattern ~ The spatial arrangement of landscape elements (patches, corridors, matrix) that determines the function of a landscape as an ecological system.

Percolation ~ The oozing or draining of water through fine, porous soil surfaces.

Perennial ~ A plant that lives for three or more years.

Physiography ~ Pertains to the study of the formation and evolution of landforms.

PILT (Payments in Lieu of Taxes) ~ Payments made to counties by the Forest Service to mitigate losses to counties because public lands cannot be taxed. Payments to counties are based on a percentage of timber receipts.

Planning area ~ In this EIS, refers to either the UCRB EIS area or the Eastside EIS area.

PM_{10} ~ Particulate matter that measures 10 micrometers in diameter or less, a size considered small enough to invade the alveolar regions of the lung. PM_{10} is one of the six pollutants for which there is a national ambient air quality standard.

Point source pollution ~ Pollution that comes from a single identifiable source such as a smokestack, a sewer, or a pipe.

Pool ~ Portion of a stream where the current is slow, often with deeper water than surrounding areas and with a smooth surface texture. Often occur above and below riffles and generally are formed around stream bends or obstructions such as logs, root wads, or boulders. Pools provide important feeding and resting areas for fish.

Pool attributes ~ Characteristics of a pool such as its depth, width, and surface texture.

Potential vegetation ~ Vegetation that would likely develop if all successional sequences were completed without human interference under present site conditions.

Potential Vegetation Group (PVG) ~ In this EIS, made up of potential vegetation types, grouped on the basis of similar general moisture or temperature environment.

Potential Vegetation Type (PVT) - In this EIS, all the species that might grow on a specific site in the absence of disturbance; can also refer to vegetation that would grow on a site in the presence of frequent disturbance that is an integral part of the ecosystem and its evolution.

Predator ~ Organism that captures and feeds on parts or all of an organism of another species.

Preferred alternative ~ The alternative identified in a Draft Environmental Impact Statement which has been initially selected by the agency as the most acceptable resolution to the problems identified in the purpose and need.

Prescribed fire ~ Intentional use of fire under specified conditions to achieve specific management objectives.

Prescribed natural fire ~ A fire ignited by lightning but allowed to burn within specified conditions of fuels, weather, and topography, to achieve specific objectives.

Prescription ~ A management pathway to achieve a desired objective(s).

Produce ~ As used in Chapter 3 of this document, refers specifically to management emphasis directed at providing, growing, or making goods and services available for human needs and/or desires, while sustaining productivity and maintaining associated values. Under a "Produce" strategy, consumption-based activities dominate the landscape; this strategy is applied to areas available and suitable for resource production. See Chapter 3 for more details.

Productivity ~ (1) *Soil productivity*: the capacity of a soil to produce plant growth, due to the soil's chemical, physical, and biological properties (such as depth, temperature, water-holding capacity, and mineral, nutrient, and organic matter content). (2) *Vegetative productivity*: the rate of production of vegetation within a given period. (3) *General*: the innate capacity of an environment to support plant and animal life over time.

Programmatic EIS ~ An area-wide EIS that provides an overview when a large-scale plan is being prepared for the management of federally administered lands on a regional or multi-regional basis. A programmatic EIS is a necessary analysis of the affected environment and the potential cumulative effects of the reasonably foreseeable actions under that program or within that geographical area. Analyses of lesser scope or more site-specificity may be tiered to the analysis in a programmatic EIS.

Proper Functioning Condition (PFC) ~ Riparian-wetland areas achieve Proper Functioning Condition when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high water flows. This thereby reduces erosion and improves water quality; filters sediment, captures bedload, and aids floodplain development; improves floodwater retention and groundwater recharge; develops root masses that stabilize streambanks against cutting action; develops diverse ponding and channel characteristics to provide habitat and water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses; and supports greater biodiversity. The functioning condition of riparian-wetland areas is a result of the interaction among geology, soil, water, and vegetation.

Project area ~ In this EIS, refers to the entire Interior Columbia Basin Ecosystem Management Project (ICBEMP) area, encompassing both EIS areas.

Proposed action ~ A proposal by a Federal agency to authorize, recommend, or implement an action.

Qualitative ~ Traits or characteristics that relate to quality and can't be measured with numbers.

Quantitative ~ Traits or characteristics that can be measured with numbers.

Rainshadow ~ An area where little or no rain falls because it is located to the leeward side of a mountain or range whose opposite side is exposed to moisture-laden winds.

Rangeland ~ Land on which the native vegetation is predominantly grasses, grass-like plants, forbs, or shrubs; not forest.

Rangeland health ~ The degree to which the integrity of the soil and the ecological processes of rangeland ecosystems are sustained.

Record of Decision (ROD) ~ An official document in which a deciding official states the alternative that will be implemented from a prepared Final EIS.

Recovery ~ (1) Return of an ecosystem to a specified condition after a disturbance; (2) return of a previously threatened or endangered species to a condition of population viability.

Recovery plan ~ Identifies, justifies, and schedules the research and management actions necessary to reverse the decline of a species and ensure its long-term survival.

Recreation Opportunity Spectrum (ROS) ~ A framework for stratifying and defining classes of outdoor recreation environment, activities, and experience opportunities. The settings, activities, and opportunities for obtaining experiences have been arranged along a continuum or spectrum divided into seven classes: Primitive, Semiprimitive, Nonmotorized, Semiprimitive Motorized, Roaded Modified, Roaded Natural, Rural, Urban.

Redd ~ Spawning nest made by salmon or steelhead in the gravel bed of a river.

Refugia ~ Areas that have not been exposed to great environmental changes and disturbances undergone by the region as a whole; refugia provide conditions suitable for survival of species that may be declining elsewhere.

Regeneration ~ The process of establishing a new crop of trees on previously harvested land; also refers to the new crop of trees that have become established.

Regional ~ In this EIS, generally refers to either the planning area (EIS area) or the project area (entire ICBEMP). In watershed discussions, also refers to first field hydrologic unit codes.

Rehabilitate ~ To repair and protect certain aspects of a system so that essential structures and functions are recovered, even though the overall sysem may not be exactly as it was before.

Resident fish ~ Fish that spend their entire life in freshwater; examples in the UCRB include bull trout and westslope cutthroat trout.

Resilient, resiliency ~ (1) The ability of a system to respond to disturbances. Resiliency is one of the properties that enable the system to persist in many different states or successional stages. (2) In human communities, refers to the ability of a community to respond to externally induced changes such as larger economic or social forces.

Resolution ~ (1) Degree of detail (finer resolution provides greater detail); (2) a solution.

Resource Management Plan (RMP) ~ A document that provides land and resource allocations, allowable uses, and resource goals, objectives, management actions, and monitoring for the Bureau of Land Management; required under the Federal Land Policy and Management Act.

Restoration ~ Holistic actions taken to modify an ecosystem to achieve desired, healthy, and functioning conditions and processes. Generally refers to the process of enabling the system to resume its resiliency to disturbances.

Restore ~ As used in Chapter 3 of this document, refers specifically to management emphasis designed to move ecosystems to desired conditions and processes, and/or to healthy forestlands, rangelands, and aquatic systems; a variety of management-induced activities dominate the landscape. Generally, "Restore" strategies are applied to areas of moderate to low ecological integrity.

Revegetation ~ Establishing or re-establishing desirable plants on areas where desirable plants are absent or of inadequate density, by management alone (natural revegetation) or by seeding or transplanting (artificial revegetation).

Riffle ~ Relatively shallow section of a stream or river with rapid current and a surface broken by gravel, rubble, or boulders.

Riparian area ~ Area with distinctive soil and vegetation between a stream or other body of water and the adjacent upland; includes wetlands and those portions of floodplains and valley bottoms that support riparian vegetation.

Riparian conservation area (RCA) ~ Portions of watersheds where riparian-dependent resources receive primary emphasis, and management activities are subject to specific standards and guidelines. RCAs include traditional riparian corridors, wetlands, intermittent headwater streams, and other areas where proper ecological functioning is crucial to maintenance of the stream's water, sediment, woody debris and nutrient delivery systems.

Riparian ecosystem ~ An ecosystem that is a transition between terrestrial and aquatic ecosystems; includes streams, lakes, wet areas, and adjacent vegetation communities and their associated soils which have free water at or near the surface; an ecosystem whose components are directly or indirectly attributed to the influence of water.

Risk assessment ~ Process of gathering data and making assumptions to estimate short- and long-term harmful effects on human health or the environment from particular products or activities.

Road ~ *BLM:* A route open normally to highway vehicles (such as trucks and automobiles); route may be improved, is maintained by mechanical means, and receives reguglar and continuous use; route must have purpose and intent to be maintained when necessary. *Forest Service*: *Arterial roads* ~ roads usually developed and operated for long-term land and resource management purposes and constant service; *Collector roads* ~ roads that collect traffic from Forest local roads, usually connecting to a Forest arterial road or public highway, operated for either constant or intermittent service depending on land use and resource management objectives; *Local roads* ~ roads that are constructed and maintained for a given resource use but also used for other purposes, with locations and standards usually determined by the requirements of a specific resource activity ather than by travel efficiency.

Rotation ~ Refers to each generation of a managed forest; the number of years between the time that a forest stand is regenerated and its final harvest.

Rubble ~ Loose, angular rock fragments.

Runoff (surface) ~ Fresh water from precipitation and melting ice that flows on the earth's surface into nearby streams, lakes, wetlands, and reservoirs.

Salmonids ~ Fishes of the family Salmonidae, including salmon, trout, chars, whitefish, ciscoes, and grayling.

Salvage ~ Harvest of trees that are dead, dying, or deteriorating due to fire, wind, insect or other damage, or disease.

Scale ~ (1) The level of resolution under consideration (for example, broad scale or fine scale); (2) the ratio of length on a map to true length.

Scientific Assessment **~** Refers to two documents produced by the ICBEMP Science Integration Team: *An Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia Basin and Portions of the Klamath and Great Basins*(Quigley, Graham, and Haynes 1996), which examines historical and current biophysical, social, and economic systems in the project area, and the associated Staff Area Reports (STARs) published as *An Assessment of Ecosystem Components [AEC] in the Interior Columbia Basin and Portions of the Klamath and Great Basins* (Quigley and Arbelbide 1996).

Scoping ~ The early stages of preparation of an environmental impact statement, used to solicit public opinion, receive comments and suggestions, and determine the issues to be considered in the development and analysis of a range of alternatives. Scoping may involve public meetings, telephone conversations, mailings, letters, or other contacts.

Sediment ~ Solid materials, both mineral and organic, in suspension or transported by water, gravity, ice, or air; may be moved and deposited away from their original position and eventually will settle to the bottom.

Seed trees ~ Mature trees left standing after timber harvest to provide seeds to regenerate the new stand; a harvest prescription.

Selective cutting ~ Cutting of intermediate-aged, mature, or diseased trees in an uneven-aged forest stand, either singly or in small groups. This encourages growth of younger trees and maintains an uneven-aged stand.

Semi-arid ~ Moderately dry; region or climate where moisture is normally greater than under arid conditions but still definitely limits the production of vegetation.

Sensitive species ~ Species identified by a Forest Service regional forester or BLM state director for which population viability is a concern either (a) because of significant current or predicted downward trends in population numbers or density, or (b) because of significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

Seral ~ Refers to the sequence of transitional plant communities during succession. Early-seral refers to plants that are present soon after a disturbance or at the beginning of a new successional process (such as seedling or sapling growth stages in a forest); mid-seral in a forest would refer to pole or medium sawtimber growth stages; late- or old-seral refers to plants present during a later stage of plant community succession (such as mature and old forest stages).

Seral stage ~ The developmental phase of a forest stand or rangeland with characteristic structure and plant species composition.

Shade-intolerant ~ Species of plants that do not grow well or die from the effects of too much shade. Generally these are fire-tolerant species.

Shade-tolerant ~ Species of plants that can develop and grow in the shade of other plants. Generally these are fire-intolerant species.

Short-term ~ In this EIS, refers to a period of less than 25 years.

Shrink-swell potential ~ The susceptibility of soil to change in volume due to a loss or gain in moisture content. A shrink-swell potential is typically associated with soils that have a high percentage of clay.

Silviculture ~ The practice of manipulating the establishment, composition, structure, growth, and rate of succession of forests to accomplish specific objectives.

Site ~ A specific location of an activity or project, such as a campground, a lake, or a stand of trees to be harvested.

Site potential ~ A measure of resource availability based on interactions among soils, climate, hydrology, and vegetation.

Site potential tree height (SPTH) ~ The average maximum height of the tallest trees (200 years or older) for a given site class.

Smolt ~ Young salmon or trout migrating to the ocean and undergoing biological changes to enable them to move from freshwater streams to saltwater.

Snag ~ A standing dead tree, usually greater than five feet tall and six inches in diameter at breast height. Snags are important as habitat for a variety of wildlife species and their prey.

Soils ~ The earth material that has been so modified and acted upon by physical, chemical, and biological agents that it will support rooted plants.

Soil productivity ~ See productivity.

Soil structure ~ Refers to the physical structure of soils that enables air and water to move or be stored.

Soil texture ~ Relative amounts of sand, silt, and clay in a soil. Coarse-textured soils are generally sandy and often contain gravel of various sizes; fine-textured soils are very fine, sandy, silty, or clayey.

Spatial ~ Related to or having the nature of space.

Spawning habitat ~ Areas used by adult fish for laying and fertilizing eggs.

Special status species ~ Refers to federally listed threatened or endangered species, Federal candidate species, species recognized as requiring special protection by State agencies, and species managed as sensitive species by the Forest Service and/or BLM.

Species ~ A population or series of populations of organisms that can interbreed freely with each other but not with members of other species.

Species richness ~ A measure of biological diversity, referring to the number of species in an area.

Stability ~ Ability of a living system to withstand or recover from externally imposed changes or stresses.

Stand ~ A group of trees in a specific area that are sufficiently alike in composition, age, arrangement, and condition so as to be distinguishable from the forest in adjoining areas.

Standards (management) ~ In this EIS, refers to required management actions specifying how to achieve objectives. Standards can include requirements to refrain from taking action in certain situations.

Stand composition ~ The vegetative species that make up the stand.

Stand density ~ Refers to the number of trees growing in a given area, usually expressed in trees per acre.

Stand-replacing fire ~ See lethal fire.

Stand structure ~ The mix and distribution of tree sizes, layers, and ages in a forest. some stands are all one size (single-story), some are two-story, and some are a mix of trees of different ages and sizes (multi-story).

State Implementation Plan (SIP) ~ A document prepared by each State describing existing air quality conditions and measures that will be taken to attain and maintain national ambient air quality standards.

Stewardship ~ Responsibility of Federal agencies to manage natural resources on public land.

Stream morphology ~ The study of the form and structure of streams.

Strongholds (fish) ~ Watersheds that have the following characteristics: (1) presence of all major life-history forms (for example, resident, fluvial, and adfluvial) that historically occurred within the watershed; (2) numbers are stable or increasing, and the local population is likely to be at half or more of its histoircal size or density; (3) the population or metapopulation within the watershed, or within a larger region of which the watershed is a part, probably contains at leat 5,000 individuals or 500 adults.

Structure ~ The size and arrangement, both vertically and horizontally, of vegetation.

Subalpine ~ A terrestrial community that generally is found in harsher environments than the montane terrestrial community. Subalpine communities are generally colder than montane and support a unique clustering of wildlife species.

Subbasin ~ A drainage area of approximately 800,000 to 1,000,000 acres, equivalent to a 4th-field Hydrologic Unit Code (HUC).

Sub-regional ~ In this EIS, generally refers to areas geographically smaller than "regional" but larger than a National Forest or BLM District. In watershed discussions in this EIS, the term also refers to the equivalent of a second field hydrologic unit code, an area of about 22 million acres.

Subsistence ~ Customary and traditional uses of wild renewable resources (plants and animals) for food, shelter, fuel, clothing, tools, etc.

Subspecies ~ A distinct, geographically separated group of organisms of a species.

Substrate ~ The soil or underlying rock on which an organism is growing or to which it is attached.

Subwatershed ~ A drainage area of approximately 20,000 acres, equivalent to a 6th-field Hydrologic Unit Code (HUC). Hierarchically, subwatersheds

(6th-field HUC) are contained within a watershed (5th-field HUC), which in turn is contained within a subbasin (4th-field HUC). This concept is shown graphically in Figure 2-2 in Chapter 2.

Succession ~ A predictable process of changes in structure and composition of plant and animal communities over time. Conditions of the prior plant community or successional stage create conditions that are favorable for the establishment of the next stage. The different stages in succession are often referred to as "seral stages." (See, Seral.)

Surface fire ~ A fire that burns surface litter, dead woody fuels, other loose debris on the forest floor, and some small vegetation, without significant movement into the overstory, usually with a flame less than a few feet high.

Sustainability ~ (1) Meeting the needs of the present without compromising the abilities of future generations to meet their needs; emphasizing and maintaining the underlying ecological processes that ensure long-term productivity of goods, services, and values without impairing productivity of the land. (2) In commodity production, refers to the yield of a natural resource that can be produced continually at a given intensity of management.

Taxa (taxon) ~ Group of organisms that share common characteristics that differ from other groups and form the basis for categories of classification such as species, genus, family.

Tectonic ~ Relating to, causing, or resulting from structural deformation of the earth's crust.

Temporal ~ Related to time.

Terrestrial ~ Pertaining to the land.

Terrestrial communities ~ Groups of cover types with similar moisture and temperature regimes, elevational gradients, structures, and use by vertebrate wildlife species.

Thermal cover ~ Cover used by animals to protect them against weather.

Thinning ~ The practice of removing some of the trees in a stand to enable remaining trees to grow faster or to change the characteristics of the stand for wildlife or other purposes.

Threatened species ~ Species listed under the Endangered Species Act that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range.

Tier ~ In an EIS, refers to incorporating by reference the analyses in an EIS of a broader scope. For example, a Forest Service project-level EIS could tier to the analysis in a Forest Plan EIS; a Forest Plan EIS could tier to a Regional Guide EIS.

Topography ~ Physical features of the ground surface such as hills, plains, mountains, steepness of slope, and other features.

Transpiration ~ Water loss from plants during the course of photosynthesis.

Tribe ~ Term used to designate a Federally recognized group of American Indians and their governing body. Tribes may be comprised of more than one band.

True firs ~ Coniferous trees of the genus *Abies*. Grand fir (*Abies grandis*) and Subalpine fir (*A. lasiocarpa*) are examples of true firs found in the UCRB. Douglas-fir (*Pseudotsuga menziesii*) is in a different genus and is more closely related to hemlocks than to true firs.

Trustee/Trust responsibilities (tribal) ~ A trustee is one who holds legal title to property to administer it for the benefit of another. The Federal Government's trust responsibility arises from promises made in treaties, executive orders, and agreements. Certain lands and resources of Indians are entrusted to the United States Government through those treaties and agreements.

Turbidity ~ The condition of a body of water that contains suspended material such as clay or silt particles, dead organisms, or small living plants and animals.

Umbrella species ~ A large-bodied wildlife species that has a large home range and broad requirements for habitats and resources; managing for an umbrella species is assumed to provide habitats and resources for other species.

Underburn ~ A burn by a surface fire that can consume ground vegetation and ladder fuels.

Understory ~ Plants that grow beneath the canopy of other plants. Usually refers to grasses, forbs, and low shrubs under a tree or shrub canopy.

Uneven-aged management ~ Method of forest management in which trees of different species in a given stand are maintained at many ages and sizes to permit continuous natural regeneration. Selective cutting is one example of an uneven-aged management method.

Uneven-aged stand ~ Stand of trees in which there are considerable differences in the ages of individual trees.

Ungulates ~ Hoofed, plant-eating mammals such as elk, deer, and cattle.

Upland ~ The portion of the landscape above the valley floor or stream.

Vascular plants ~ Plants that have vessels and ducts to conduct water and sugars; flowering plants, ferns, and their allies are vascular plants.

Vegetative composition ~ The plant species present in a plant community.

Vertebrate ~ An animal with a backbone; mammals, fishes, birds, reptiles, and amphibians are vertebrates.

Viable population ~ A population that is regarded as having the estimated numbers and distribution of reproductive individuals to ensure that its continued existence is well distributed in the project area.

Visual resources ~ The visible physical features of a landscape.

Water Quality Limited ~ A Clean Water Act classification for waters where application of best management practices or technology-based controls are not sufficient to achieve designated water quality standards.

Watershed ~ (1) The region draining into a river, river system, or body of water. (2) In this EIS, a watershed also refers specifically to a drainage area of approximately 50,000 to 100,000 acres, which is equivalent to a 5th-field Hydrologic Unit Code (HUC).

Weed ~ A plant considered undesirable, unattractive, or troublesome, usually introduced and growing without intentional cultivation.

Wetland ~ In general, an area soaked by surface or groundwater frequently enough to support vegetation that requires saturated soil conditions for growth and reproduction; generally includes swamps, marshes, springs, seeps, bogs, wet meadows, mudflats, natural ponds, and other similar areas. Legally, Federal agencies define wetlands as possessing three essential characteristics: (1) hydrophytic vegetation, (2) hydric soils, and (3) wetland hydrology. The three technical characteristics specified are mandatory and must all be met for an area to be identified as a wetland. *Hydrophytic vegetation* is defined as plant life growing in water, soil, or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content. *Hydric soils* are defined as soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic (without oxygen) conditions in the upper part of the soil profile. Generally, to be considered a hydric soil, there must be saturation at temperatures above freezing for at least seven days. *Wetland hydrology* is defined as permanent or periodic inundation, or soil saturation to the surface, at least seasonally.

Wilderness ~ Area where the earth and its community of life have not been seriously disturbed by humans and where humans are only temporary visitors. In this document, when the term is capitalized, "Wilderness" refers to specific lands designated by Congress as Wilderness Areas and protected and managed to preserve their natural condition; when the term is not capitalized, "wilderness" refers to other areas that have pristine and natural characteristics.

Wildfire ~ A human or naturally caused fire that does not meet land management objectives.

Windthrow ~ Trees blown over by the wind.

Woody ~ Composed of wood or woody fibers.

Xeric ~ Very dry region or climate; tolerating or adapted to dry conditions.

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Acronyms and Symbols

AEC	Assessment of Ecosystem Components
AFSEEE	Association of Forest Service Employees for Environmental Ethics
ARPA	Archaeological Resources Protection Act
ASQ	Allowable Sale Quantity
AUM	Animal Unit Month
BBF	Billion Board Feet
BEA	Bureau of Economic Analysis
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMP	Best Management Practice
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CRBSUM	Columbia River Basin Successional Model
CWD	Coarse Woody Debris
DBH	Diameter at Breast Height (4.5 feet)
DEIS	Draft Environmental Impact Statement
DRFC	Desired Range of Future Conditions
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ERU	Ecological Reporting Unit
ESA	Endangered Species Act
EAWS	Ecosystem Analysis at the Watershed Scale
FACA	Federal Advisory Committee Act
FEIS	Final Environmental Impact Statement
FEMAT	Forest Ecosystem Management Assessment Team
FERC	Federal Energy Regulatory Commission
FLPMA	Federal Land Policy and Management Act
FOIA	Freedom of Information Act
FSH	Forest Service Handbook
FSM	Forest Service Manual
GIS	Geographic Information System
HRV	Historical Range of Variability
HUC	Hydrologic Unit Code
ICBEMP	Interior Columbia Basin Ecosystem Management Project
INFISH	Interim Inland Native Fish Strategy for the Forest Service's Intermountain, Northern, and Pacific Northwest Regions
IWM	Integrated Weed Management
MMBF	Million Board Feet
MOU	Memorandum of Understanding
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NMFS	National Marine Fisheries Service
NRCS	Natural Resources Conservation Service (formerly Soil Conservation Service)
NOI	Notice of Intent
PAC	Provincial Advisory Committee
PACFISH	Environmental Assessment for the Implementation of Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California
PFC	Proper Functioning Condition
PILT	Payment in Lieu of Taxes
PVG	Potential Vegetation Group
PVT	Potential Vegetation Type
RAC	Resource Advisory Council
RCA	Riparian Conservation Area
RMO	Riparian Management Objective
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
RHCA	Riparian Habitat Conservation Area (PACFISH)
SCORP	Statewide Comprehensive Outdoor Recreation Program
SIT	Science Integration Team
STAR	Staff Area Report (see AEC)
TMDL	Total Maximum Daily Load
UCRB	Upper Columbia River Basin
USDA	United States Department of Agriculture
USDI	United States Department of Interior
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
>	Greater than
<	Less than